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User Manual

GIPAM • GIMAC-II • GMPC-III

LG Industrial Systems
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GIPAM USER MANUAL
(Digital Integrated Protection & Monitoring Equipment)

LG Industrial Systems

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1 Summary

LG Digital Integrated Protection and Measurement device indicates and measures electricity amount of various kinds such as 3 phases voltage, current, power electricity, power factor, frequency, zero phase voltage and so on. It also has 6 kinds of function for the protection relay (OCR, OCGR, OVR, UVR, OVGR, SGR). It can be applied at 1W2P/3P, 3W3P/4P.

2 Characteristics

1) Compact and Simple

- GIPAM is an assortment of equipments for switchgear panel. It includes panel meters, protection relays, operating and transffering switchs and lamps in one unit.
- Various types of characteristic curves are provided.
- It makes high reliance of protection by adopting . technology of digitail filter applied 16bit μ-processor.

2) Self Diagnosis Function

GIPAM detects an error of CPU operation or circuit of signal input immediately and it indicates caution and reason of error. It also has a data transmission function .

3) An outstanding flexibility

GIPAM corresponds suitably to a change of PT ratio, CT ratio and wirings through setting DIP Switches.

4) Fault & Event Recording

- 255 Faults and Events can be recorded.(a 10ms aberration)
- It is available to analyze an error of system and a daily or monthly record.

3 Main Features

1) High accuracy measuring function

- 3 Phases Voltage/Current
- Power Active(Watt)/Reactive(Vars)
- Energy Active(Wh)/Reactive(Varh)
- Power Factor
- Frequency
- Zero Phase Voltage(Vo)

2) Multi Functional Relays

- OCR (Overcurrent relay)
- OCGR (Overcurrent ground relay)
- UVR (Under voltage relay)
- OVR (Over voltage relay)
- OVGR (Over voltage ground relay)
- SGR (Sensitive ground relay)

3) Indication Function

- Indicates the status of protection relay and circuit breaker on front LED.
- Displaying status via digital LCD and analog bar graph to offer better visual effect to customer.
- Error message is indicated on front DOT Matrix LED when error occurs.

4) Communication Function

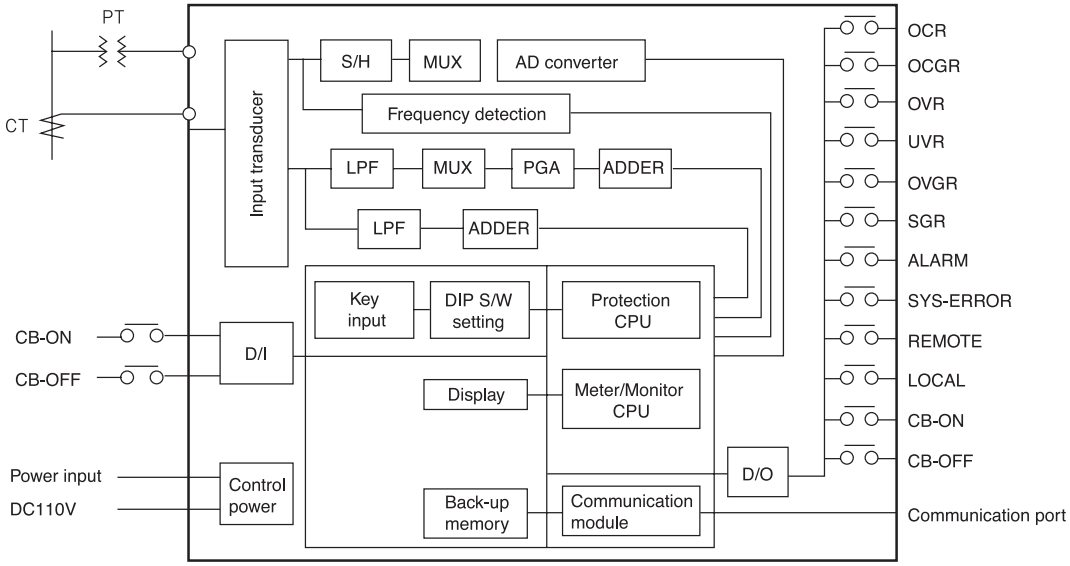
- All data and information can be transferred to a host computer up to 255 sets of GIPAM with high speed (250kbps) through internal communication module.

4 External view and System structure

4-1 External view and part name

Key No.	Description	Key No.	Description
1	Reset key to reset fault indications	11	Function key, red LED
2	Dot matrix LED display	12	Communication LED, blinking on communicating
3	Fault indication LEDs	13	Power LED, red LED
4	Set/Run key	14	CB ON key, red LED
5	Characteristic key	15	CB OFF key, green LED
6	Enter key	16	Selection key for CB local operation, yellow LED
7	Decrement key	17	Selection key for CB remote operation, yellow LED
8	Increment key	18	Clear key
9	LCD display	19	CPU reset key
10	Display selection key	20	Control key protection cover

4-2 System structure



5 Spacification

5-1 Metering

1)Input specification

Contents		Rating
Wiring Type		1P2W, 1P3W, 3P3W, 3P4W
Input Range	Frequency	60Hz
	Voltage	AC10~132V/AC20~264V
	Current	0.2~6A

2) Range of the metering result

Meter Menu		Metering Value	Displayed Range	Accuracy(%)	Remarks
Voltage(V)		RMS Value	LCD: AC10~154000(V) Bargraph:0 to 120(%)	± 1.0%	Between Phases Between phase and Neutral
Current(A)		RMS Value	LCD: AC0.2~6000(A) Bargraph:0 to 120(%)	± 1.0%	Each phase
Zero Phase Voltage(Vo)		RMS Value	0~190(V)	± 2.5%	Max. Value back up
Power	Active, Watt	Average Value	LCD: 0~9999(MW) Bargraph:0 to 120(%)	± 2.0%	
	Reactive, Vars	Average Value	LCD: 0~9999(MVars) Bargraph:0 to 120(%)	± 2.0%	
Energy	Active, Wh	Accumulated Value	0-999999(MWh)	± 2.0%	
	Reactive, Varh	Accumulated Value	0-999999(MVarh)	± 2.0%	
Power Factor, PF		Average Value	Lead/Lag 0-100(%)	± 2.0%	
Frequency(Hz)		Average Value	45~65(Hz)	± 0.5%	

3) Input/Output Contact

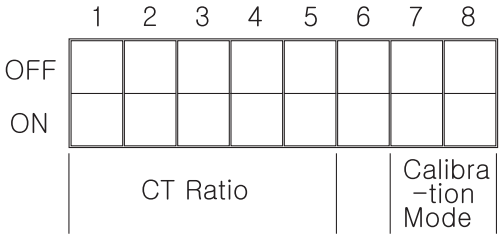
MENU	Contents	Type	Rating
Input	CB-ON CB-OFF	DC110(V)	Connected Voltage and Current to origin of signal: DC110V, 5mA Max
Output	OCR OCGR OVR UVR OVR SGR Alarm System Error CB-ON CB-OFF	Zero Voltage "a" Contact	Resitance Load: AC250V, 10A DC 30V, 10A CosΦ=1.0 Induction Load: AC250V, 7.5A DC 30V, 5A CosΦ=0.4, L/R=7ms Switching Capacity: 2.500VA, 300W
	REM/LOC	"C" Contact	

4) Displaying a status of Circuit Breaker and operation

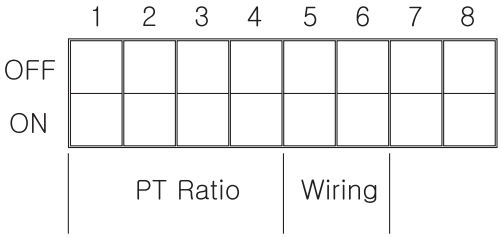
LED Lamp Name	Detail
CB-On (Red)	LED lamp will be on when breaker is "on" position.
CB-Off (Green)	LED lamp will be on when breaker is "Off" position.
Local (Yellow)	When operator select local control, LED lamp will be turned on.
Remote(Yellow)	When operator select remote control, LED lamp will be turned on.
Power (Red)	LED lamp will be on during the system is operated.
Comm (Red)	LED lamp blinks when GIPAM is communicated with host.
Func (Red)	When operator select special function mode, LED lamp will be turned on.

5) Setting a metering part

Setting object	Detail	Location
Metamorphosis Ratio	CT Ratio: DIP Switch(#1) 5bit PT Ratio: DIP Switch(#2) 4bit	Upper part of main board
CPU Reset Calibration Mode Connetion Method	Reset all data of CPU Set up DIP Switch(#1) by 2bit Set up DIP Switch(#2) by 2bit	
Communication Address	Set up specific address by 16 bit switch.	Main Board



[DIP S/W #1]



[DIP S/W #2]

Note) Please do not operate no. 7 and no. 8 of DIP Switch #1.

→ LGIS set up in best condition when it is shipped from the factory. Please do not operate or change the setting value. In case of reset unwillingly, please refer to appendix.

6) Other specification

Contents		ail	
Input burden		Voltage	Under 0.1 VA
		Current	Under 1 VA
Control Power		Voltage	DC110[V] (93.5~121V)]
		Current	Under 15[W]
Data Backup		Over 10 years by adopting NV-RAM.	
Temperature	Operation	-10~55℃	
	Storage	-25~75℃	
Humidity		80% RH(Non-condensing)	
Insulated Resistance		Over DC500V 10MΩ, Tested part is the same as impulse voltage.	
Power Frequency withstand Voltage		Between electrical circuit ground: AC 2,000V/1min.	
		Between electrical circuit phase: AC 2,000V/1min.	
		Between electrical circuit terminal: AC 1,000V/1min.	
Lightning Impulse Voltage		5kV for 1.2×50μ	
		3kV for 1.2×50μ	
Overload Withstand Capacity	Current Circuit	Rated amp.×2 for 3hours	
		Rated amp.×20 for 2 seconds	
	Voltage Circuit	Rated volts×1.15 for 3 hours	
Applied Standard		IEC 60255, KEMC 1120, JEC174C	

5-2 Protection

1) INPUT

Contents		Detail
Input Range	Frequency	60Hz
	Voltage	PT: 110[V], GPT: 190[V]
	Current	CT: 5[A], ZCT:1.5mA

6 Operating

6-1 Measuring Part

6-1-1 Calibration Mode

A calibration mode of metering consists of 2 modes. One is adjusting offset and gain of A/D converter and the other is selecting the ratings of analog input signal. (Please do not adjust a calibration mode temporarily. If there are necessity of adjustment, refer to appendix.)

6-1-2 Measurement display

The measurement result is displayed by pushing the measurement selection key.

Easurement key displays	
	FUNC + V : PT Ratio A : CT Ratio F : Connection W : Comm Address Var : C/B Operatopn Pf : Display All Wh : C/B ON Time Varh : Vo/Vomax

1) Current

Display panel shows current value of phase “R” at the initial status. Each phase of current measurement value will be displayed continuously with the “A” unit by repeating to push the touch switch “A”. (It is possible to check the type of wiring when operator pushes the Function and F key at the same time.)

Type of wiring	Displayed phase	Remark
1P2W 1P3W 3P3W, 3P4W	Measurement value of each phase R → N → T R → S → T	

2) Voltage

Each phase of voltage measurement value will be displayed continuously with the "V" unit by repeating to push the touch switch "V".

Type of wiring	Displayed phase	Remark
1P2W	Measurement value of each phase	
1P3W	RN → TN → RT	
3P3W	RS → ST → RT	
3P4W	RN → SN → TN →RS → ST → RT	

3) Power

Active power is displayed with "W" unit by pushing touch switch "W" and reactive power will be displayed with "Var" by pushing touch switch Var.

4) Energy

Active energy is displayed with "WH" unit by pushing touch switch "Wh" and reactive energy will be displayed with unit "Varh" pushing touch switch Varh.

5) Power Factor

Power factor is displayed by pushing touch switch PF with "%" unit and also displayed "LEAD" or "LAG".

6) Frequency

Frequency is displayed by pushing touch switch F with "Hz" unit and it displays the first decimal place.

6-1-3 Special Function

Pushing the FUNC Switch, it is transferred to special function mode and the switch lamp is turned on. It shows special function mode continuously during the switch lamp of FUNC Switch is on. If operator pushes the FUNC Switch again, it will return to standard mode. If it is changed to special mode, measuring switch function will be changed and it displays as followings:

1) **FUNC+V**: It displays PT ratio setting value of DIP Switch.
2) **FUNC+A**: It displays CT ratio setting value of DIP Switch.
3) **FUNC+A**: It displays wiring type

4) **FUNC+W**: It displays a settled own address at telecommunication part of main board.
5) **FUNC+Var**: It displays the number of operation time of the circuit breaker which is connected to CB ON input contact.
6) **FUNC+PF**: It displays all the measured data by the following sequence in a row(V → A → W → VAR → WH → VARH → F → PF, Voltage/Current: every phases have been measured.)
7) **FUNC+Wh**: It displays the let through time(Hour unit) of the CB which is connected to the CB ON input contact. When the time is over 9999hours, it displays the time by the bargraph on the 10000 hours unit.
8) **FUNC+VARH**: It displays Vo with N1 and Vo max. with N2.

6-1-4. CB operation and local or remote control

1) LOCAL: It is the key for the local operation . If press this button, local output contact will be on and it makes possible to operate C/B on or off by pressing the keys on the front.

2) Remote: It is the key for the remote control . If press this button, remote output contact will be on and it can be possible to operate C/B on or off by telecommunication at host computer.

3) CB ON/OFF: If press the ON/OFF switch, output contact will be conducted during from 0.5 to 0.6 seconds. It makes operate CB(ON/OFF Operation) when local operation switch is selected.

6-1-5. Others

1) Clear switch
   . The clear switch in the back plate reset the WH & VARH value to “0”
   . The users should press the reset button when you first install the system.
2) CPU Reset button
   . The CPU reset switch in the back plate clear all the data in the CPU. When you found the operations of the equipment is unusual, you can press and restart.
3) COMM LED
   During the communication with monitoring computer, it is go on and off.

6-1-6. Display for the system error

Error code will be displayed in case of it is out of order. Error code is displayed as followings :

Error 0: PT ratio setting is wrong.
Error 1: CT ratio setting is wrong.
Error 2: Detect voltage error of analog circuit and input circuit.
Error 3: Detect internal telecommunication error.
Error 4: Detect CPU abnormal operation.

6-2 Protection part

6-2-1 Initialization setting

1) DIP switch setting

Set up a use frequency and an assigned function of relay.

2) Calibration of input amount of energy

Please do not adjust a calibration mode temporarily. If there are necessity of adjustment, please refer to appendix.)

6-2-2. Operation

1) Display of operating status

- After power is on, DOT-matrix and LCD part will be turned on during 1 second. If displayed [Run...], it means normal operating status.
- It displays system error and fault of relay.
- Function of each key

◆ [SET/RUN] : Changing the normal mode to the setting mode or vise versa.
◆ [CHAR] : It is an effective key at setting mode and makes possible to move among the setting menu of each really facts.
◆ [▼] : It is effective key at setting mode and it makes possible to decrease the set data.
◆ [▲] : It is effective key at setting mode and it makes possible to increase the set data.
◆ [ENT] : It is effective key at setting mode and it saves the corrected data.
◆ [RESET] : It is effective key at Normal mode When remove the cause of system error and fault, it resets error indication.

2) Protection function setting

Dot Matrix LED displays [Run...] as normal state when control power is supplied to GIPAM. Press [Set/Run] key to move to setting mode to set following protection functions.

Function	Setting mode		Setting range
OCR	Time delay pick-up current	I >	0.4 to 3.2 (2 to 16A)
	Instantaneous pick-up current	I>>	2 to 20 (10 to 100A), 0 (In case of lock)
	Operation curve types	Cv	Definite time delay (D2, D4, D8), Inverse time delay (SI, VI, EI, LI)
	Operation tap	t	0.05 to 1.00 (tap)
OCGR	Time delay pick-up current	I >	0.10 to 0.50 (0.5 to 2.5A)
	Instantaneous pick-up current	I>>	0.50 to 8.0 (2.5 to 40A), 0 (In case of lock)
	Operation curve types	Cv	Definite time delay (D2, D4, D8), Inverse time delay (SI, VI, EI, LI)
	Operation tap	t	0.05 to 1.00 (tap)
	Operation mode	MD	XX, AL, TP
OVR	Operation voltage	Ov	1.10 to 1.50 (121 to 165V)
	Operation time	t	0.05, 0.1 to 10 (sec)
	Operation mode	MD	XX, AL, TP
UVR	Operation voltage	Uv	0.50 to 0.90 (55 to 99V)
	Operation time	t	0.03, 0.1 to 10.0 (sec)
	Operation mode	MD	XX, AL, TP, TA(Auto reset)
OVGR	Time delay pick-up voltage	V >	0.10 to 0.40 (19 to 76V)
	Instantaneous pick-up voltage	V>>	0.10 to 0.40 (19 to 76V), OFF
	Operation tap	t	0.05 to 1.00 (tap)
	Operation mode	MD	XX, AL, TP
SGR	Operation current	Io	0.6 to 3.6 (0.9 to 5.4mA)
	Operation voltage	Vo	0.10 to 0.40 (19 to 76V)
	Operation time	t	0.1 to 10.0 (sec)
	Operation mode	MD	XX, AL, TP

Note 1> D2, D4, D8 : Definite time delay (t = 2, 4, 8)

2> SI, VI, EI, LI : Standard Inverse, Very Inverse, Extremely Inverse and Long Inverse time delay curves, respectively

3> XX, AL, TP : Operation mode setting

(XX : no operation, AL : alarm mode, TP : alarm & trip mode)

3) Display of fault status

◆ Fault LED is turned on in case of error detected each factor of relay. It displays by blinking the value of operation or the factor of operation.

Fault LED of Relay	LCD Display	Remark
OCR operated	Ir (value)	Ir, Is, It(Over current occurs on phase R,S or T.) (Value of Indicator) x 5(A) x CT Ratio → Operated current of OCR.
OCGR operated	I⏚ (value)	(Value of Indicator) x 5(A) x CT Ratio → Operated current of OCGR.

OVR operated	Ov (value)	(Value of Indicator x 110(V) x PT Ratio → Operated voltage of OVR.
UVR operated	Uv (value)	(Value of Indicator) x 110(V) x PT Ratio → Operated Voltage of UVR.
OVGR operated	V ⏚ (value)	(Value of Indicator) x 190(V) x GPT Ratio → Operated Voltage of OCGR.
SGR operated	SGR	

◆ If press the [reset] key after removing the cause of fault, a relay will be on operation.

4) Measuring display of protection relay part

◆ If press the [CHAR] key during the [Run..] is displayed at operating mode, measurement

value will be displayed with the Ir. If repeat to press the [CHAR] key, it displays measurement value of each contents in a row as followings. But the fact value of measurement calculated by formula as table.

(Ir → Is → It → I ⏚ → Ov → Uv → V ⏚ → Io → Run..)

Contents	LCD Display	The fact value
Current of Phase "R"	Ir (value)	Value of indication: 5(A), CT Ratio
Current of Phase "S"	Is (value)	Value of indication: 5(A), CT Ratio
Current of Phase "T"	It (value)	Value of indication: 5(A), CT Ratio
Current of Ground Fault	I ⏚ (value)	Value of indication: 5(A), CT Ratio
Voltage	Ov (value)	Value of indication: 110(V), PT Ratio
	Uv (value)	Value of indication: 110(V), PT Ratio
Zero Phase Voltage	V ⏚ (value)	Value of indication: 190(V), GPT Ratio
Zero Phase Current	Io (value)	Value of indication: 1.5(mA), ZCT Ratio

5) Display of System error

◆ Error code is blinking and displaying when internal trouble occurs. Error codes are same as followings:

ERR 1 : Detect the analog circuit error of voltage or input circuit.

ERR 2 : Detect damage of back-up data

ERR 3 : Detect obstruction of internal telecommunication(RS-232C)

Index	operating switches	LCD	Remarks
OCR	Pressing [SET/ RUN] Key	After displaying "Set…" I > 0.4	To Move to setting menu for overcrrent of Time delay
	Setting an appropriate value with [▼] or [▲] Key	I > 0.4	Setting an overcurrent value for Time delay 0.4 ~ 3.2(0.1step)
	Pressing [Ent] Key to store	I > (set value)	Storing the value set
	Pressing [Char] Key	I > > 2	To Move to setting menu for overcrrent of Instantaneous
	Setting an appropriate value with [▼] or [▲] Key	I > > 2	Setting an overcurrent value for Instantaneous 2 ~ 20(1step)
	Pressing [Ent] Key to store	I > > (set value)	Storing the value set
	Pressing [Char] Key	Cv SI	To Move to setting menu for Time Characteristic Curve
	Setting an appropriate value with [▼] or [▲] Key	Cv SI	Selecting an T/C Curve for OCR Definite Time (D2,4,8) Inverse Time (SI,VI,EI,LI)
	Pressing [Ent] Key to store	Cv (selected curve)	Storing the curve selected
	Pressing [Char] Key	t 0.05	To Move to setting menu for operating time
	Setting an appropriate value with [▼] or [▲] Key	t 0.05	Setting an operating time for OCR 0.05 ~ 1.00(0.01step) (Refer to 6-2-3.)
	Pressing [Ent] Key to store	t (set time)	Storing the time set (The function of OCR is selectedas default)

Index	operating switches	LCD	Remarks
OCGR	Pressing [Char] Key	I > 0.10	To Move to setting menu for earth crrent of Time delay
	Setting an appropriate value with [▼] or [▲] Key	I > 0.10	Setting an earth current value for Time delay 0.10 ~ 0.50(0.02step)
	Pressing [Ent] Key to store	I > (set value)	Storing the value set
	Pressing [Char] Key	I > > 0.50	To Move to setting menu for earth crrent of Instantaneous
	Setting an appropriate value with [▼] or [▲] Key	I > > 0.50	Setting an earth current value for Instantaneous 0.50 ~ 8.0(0.5step)
	Pressing [Ent] Key to store	I > > (set value)	Storing the value set
	Pressing [Char] Key	Cv SI	To Move to setting menu for Time Characteristic Curve
	Setting an appropriate value with [▼] or [▲] Key	Cv SI	Selecting an T/C Curve for OCGR Definite Time (D2,4,8) Inverse Time (SI,VI,EI,LI)
	Pressing [Ent] Key to store	Cv (selected curve)	Storing the curve selected
	Pressing [Char] Key	t 0.05	To Move to setting menu for operating time
	Setting an appropriate value with [▼] or [▲] Key	t 0.05	Setting an operating time for OCGR 0.05 ~ 1.00(0.01step) (Refer to 6-2-3.)
	Pressing [Ent] Key to store	t (set time)	Storing the time set

Index	operating switches	LCD	Remarks
OCGR	Pressing [Char] Key	MD TP	To Move to setting menu for operating mode
	Setting an appropriate value with [▼] or [▲] Key	MD TP	Selecting an operating mode for OCGR TP (Trip & Alarm) AL(Alarm), XX(no operation)
	Pressing [Ent] Key to store	MD (selected mode)	Storing the mode selected
OVR	Pressing [Char] Key	Ov 1.10	To Move to setting menu for a overvoltage value
	Setting an appropriate value with [▼] or [▲] Key	Ov 1.10	Setting a value of overvoltage 1.10 ~ 1.50(0.02step)
	Pressing [Ent] Key to store	Ov (set value)	Storing the value set
	Pressing [Char] Key	t 0.05	To Move to setting menu for operating time
	Setting an appropriate value with [▼] or [▲] Key	t 0.05	Setting an operating time for OVR 0.05, 1 ~ 10.0(0.1step)
	Pressing [Ent] Key to store	t (set time)	Storing the time set
	Pressing [Char] Key	MD TP	To Move to setting menu for operating mode
	Setting an appropriate value with [▼] or [▲] Key	MD TP	Selecting an operating mode for OVR TP(Trip & Alarm) AL(Alarm), XX(no operation)
	Pressing [Ent] Key to store	MD (selected mode)	Storing the mode selected

Index	operating switches	LCD	Remarks
UVR	Pressing [Char] Key	Uv 0.50	To Move to setting menu for a undervoltage value
	Setting an appropriate value with [▼] or [▲] Key	Uv 0.50	Setting a value of undervoltage 0.50 ~ 0.90(0.02step)
	Pressing [Ent] Key to store	Uv (set value)	Storing the value set
	Pressing [Char] Key	t 0.03	To Move to setting menu for operating time
	Setting an appropriate value with [▼] or [▲] Key	t 0.03	Setting an operating time for UVR 0.03, 0.1 ~ 10.0(0.1step)
	Pressing [Ent] Key to store	t (set time)	Storing the time set
	Pressing [Char] Key	MD TP	To Move to setting menu for operating mode
	Setting an appropriate value with [▼] or [▲] Key	MD TP	Selecting an operating mode for UVR TP(Trip & Alarm), AL(Alarm) XX(no operation), TA(Auto Reset)
	Pressing [Ent] Key to store	MD (selected curve)	Storing the mode selected
OVGR	Pressing [Char] Key	V > 0.10	To Move to setting menu for a zero phase sequence voltage value of Time delay
	Setting an appropriate value with [▼] or [▲] Key	V > 0.10	Setting a zero phase sequence voltage value for Time delay 0.10 ~ 0.40(0.02step)
	Pressing [Ent] Key to store	V > (set value)	Storing the value set

Index	operating switches	LCD	Remarks
OVGR	Pressing [Char] Key	V > > 0.10	To Move to setting menu for a zero phase sequence voltage value of Instantaneous
	Setting an appropriate value with [▼] or [▲] Key	V > > 0.10	Setting a zero phase sequence voltage value for Instantaneous 0.10 ~ 0.40, off (0.02step)
	Pressing [Ent] Key to store	V > > (set value)	Storing the value set
	Pressing [Char] Key	t 0.05	To Move to setting menu for operating time
	Setting an appropriate value with [▼] or [▲] Key	t 0.05	Setting an operating time for OVGR 0.05 ~ 1.00(0.01step (Refer to 6-2-3.)
	Pressing [Ent] Key to store	t (set time)	Storing the time set
	Pressing [Char] Key	MD TP	To Move to setting menu for operating mode
	Setting an appropriate value with [▼] or [▲] Key	MD TP	Selecting an operating mode for OVGR TP(Trip & Alarm) AL(Alarm), XX(no operation)
	Pressing [Ent] Key to store	MD (selected mode)	Storing the mode selected
SGR	Pressing [Char] Key	Io 0.6	To Move to setting menu for a value of zero phase sequence current
	Setting an appropriate value with [▼] or [▲] Key	Io 0.6	Setting a value of zero phase sequence current 0.6 ~ 3.6 (0.2step)
	Pressing [Ent] Key to store	Io (set value)	Storing the value set

Index	operating switches	LCD	Remarks
SGR	Pressing [Char] Key	Vo 0.1	To Move to setting menu for a value of zero phase sequence voltage
	Setting an appropriate value with [▼] or [▲] Key	Vo 0.1	Setting a value of zero phase sequence voltage 0.1 ~ 0.4 (0.02step)
	Pressing [Ent] Key to store	Vo (set value)	Storing the value set
	Pressing [Char] Key	t 0.1	To Move to setting menu for operating time
	Setting an appropriate value with [▼] or [▲] Key	t 0.1	Setting an operating time for SGR 0.1 ~ 10.0(0.1step)
	Pressing [Ent] Key to store	t (set time)	Storing the time set
	Pressing [Char] Key	MD TP	To Move to setting menu for operating mode
	Setting an appropriate value with [▼] or [▲] Key	MD TP	Selecting an operating mode for SGR TP (Trip & Alarm) AL(Alarm), XX(no operation)
	Pressing [Ent] Key to store	MD (selected mode)	Storing the mode selected
	Pressing [SET/ RUN] Key	Returning to "Run…" mode	Returning to Normal mode after completing the setting

6-2-3. The formula of Time Characteristic Curve

1) Time Characteristic

$$t = T \times TL \text{ (sec)}$$

ⓐ "T" is an operating characteristic and it should be one of the following formulas.(Time Delay Characteristic, IEC 255-3 is applied)

Standard Inverse (SI) $T = \dfrac{0.14}{(I/Is)^{0.02} - 1}$

Very Inverse (VI) $T = \dfrac{13.5}{(I/Is) - 1}$

Extreme Inverse (EI) $T = \dfrac{80}{(I/Is)^{2} - 1}$

Long Inverse (LI) $T = \dfrac{120}{(I/Is) - 1}$

Definite Time (D2) T = 2
Definite Time (D4) T = 4
Definite Time (D8) T = 8

(Vid.: I = Operated Current
Is = Set Current)

ⓑ TD is the value that determines operating time and ranges from 0.05 to 1.00

2) The value of operating characteristic

* The operating time below is the value when TD equals 1.

ⓐ Standard Inverse Time

(I/Is)		(sec)
1.00	--->	
2.00	--->	10.029
3.00	--->	6.302
4.00	--->	4.980
5.00	--->	4.280
6.00	--->	3.837
7.00	--->	3.528
8.00	--->	3.297
9.00	--->	3.116
10.00	--->	2.971
11.00	--->	2.850
12.00	--->	2.748
13.00	--->	2.660
14.00	--->	2.583
15.00	--->	2.516
16.00	--->	2.455
17.00	--->	2.401
18.00	--->	2.353
19.00	--->	2.308
20.00	--->	2.267

ⓑ Very Inverse Time

(I/Is)		(sec)
1.00	--->	
2.00	--->	13.500
3.00	--->	6.750
4.00	--->	4.500
5.00	--->	3.375
6.00	--->	2.700
7.00	--->	2.250
8.00	--->	1.929
9.00	--->	1.688
10.00	--->	1.500
11.00	--->	1.350
12.00	--->	1.227
13.00	--->	1.125
14.00	--->	1.038
15.00	--->	0.964
16.00	--->	0.900
17.00	--->	0.844
18.00	--->	0.794
19.00	--->	0.750
20.00	--->	0.711

ⓒ Extreme Inverse Time

(I/Is)		(sec)
1.00	--->	
2.00	--->	26.667
3.00	--->	10.000
4.00	--->	5.333
5.00	--->	3.333
6.00	--->	2.286
7.00	--->	1.667
8.00	--->	1.270
9.00	--->	1.000
10.00	--->	0.808
11.00	--->	0.667
12.00	--->	0.559
13.00	--->	0.476
14.00	--->	0.410
15.00	--->	0.357
16.00	--->	0.314
17.00	--->	0.278
18.00	--->	0.248
19.00	--->	0.222
20.00	--->	0.201

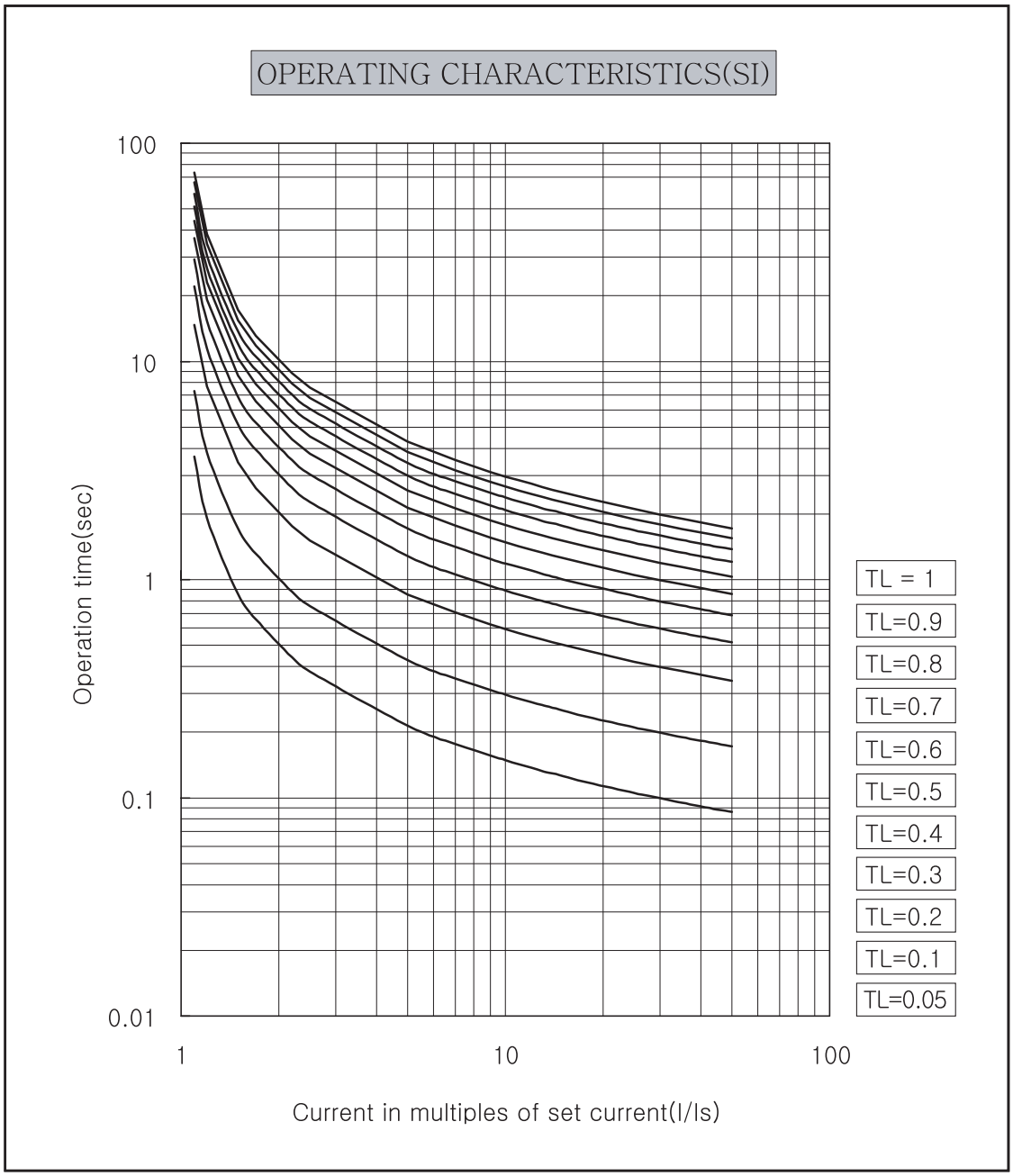
ⓓ Long Inverse Time

(I/Is)		(sec)
1.00	--->	
2.00	--->	120.000
3.00	--->	60.000
4.00	--->	40.000
5.00	--->	30.000
6.00	--->	24.000
7.00	--->	20.000
8.00	--->	17.143
9.00	--->	15.000
10.00	--->	13.333
11.00	--->	12.000
12.00	--->	10.909
13.00	--->	10.000
14.00	--->	9.231
15.00	--->	8.571
16.00	--->	8.000
17.00	--->	7.500
18.00	--->	7.059
19.00	--->	6.667
20.00	--->	6.316

6-2-4. Characteristic Operation Curve

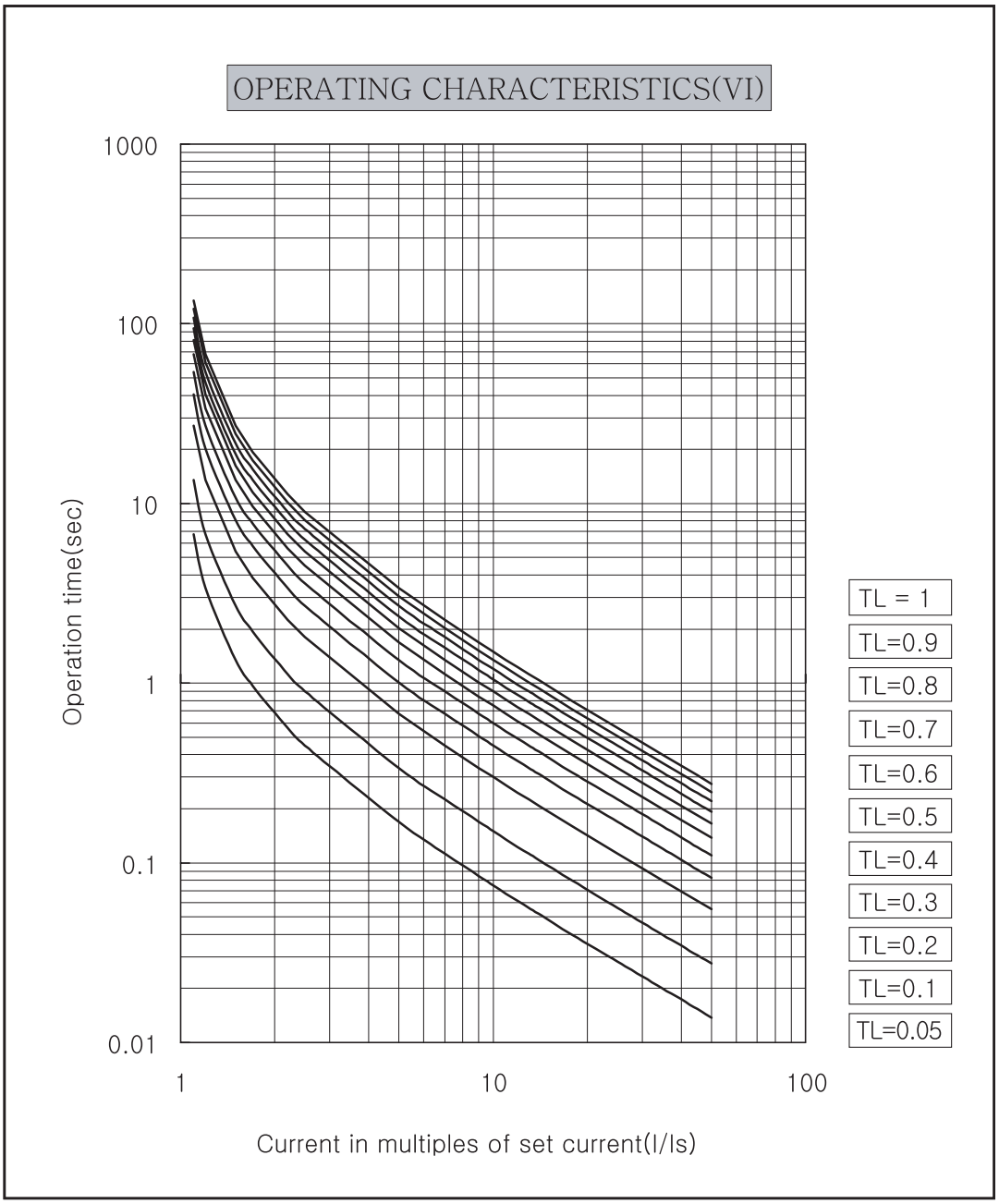
1) SI(Standard Inverse Time)- OCR, OCGR, OVGR

$$t = \frac{0.14}{(I / Is)^{0.02} - 1} \times TL \quad (TL : 0.05 \sim 1.00)$$



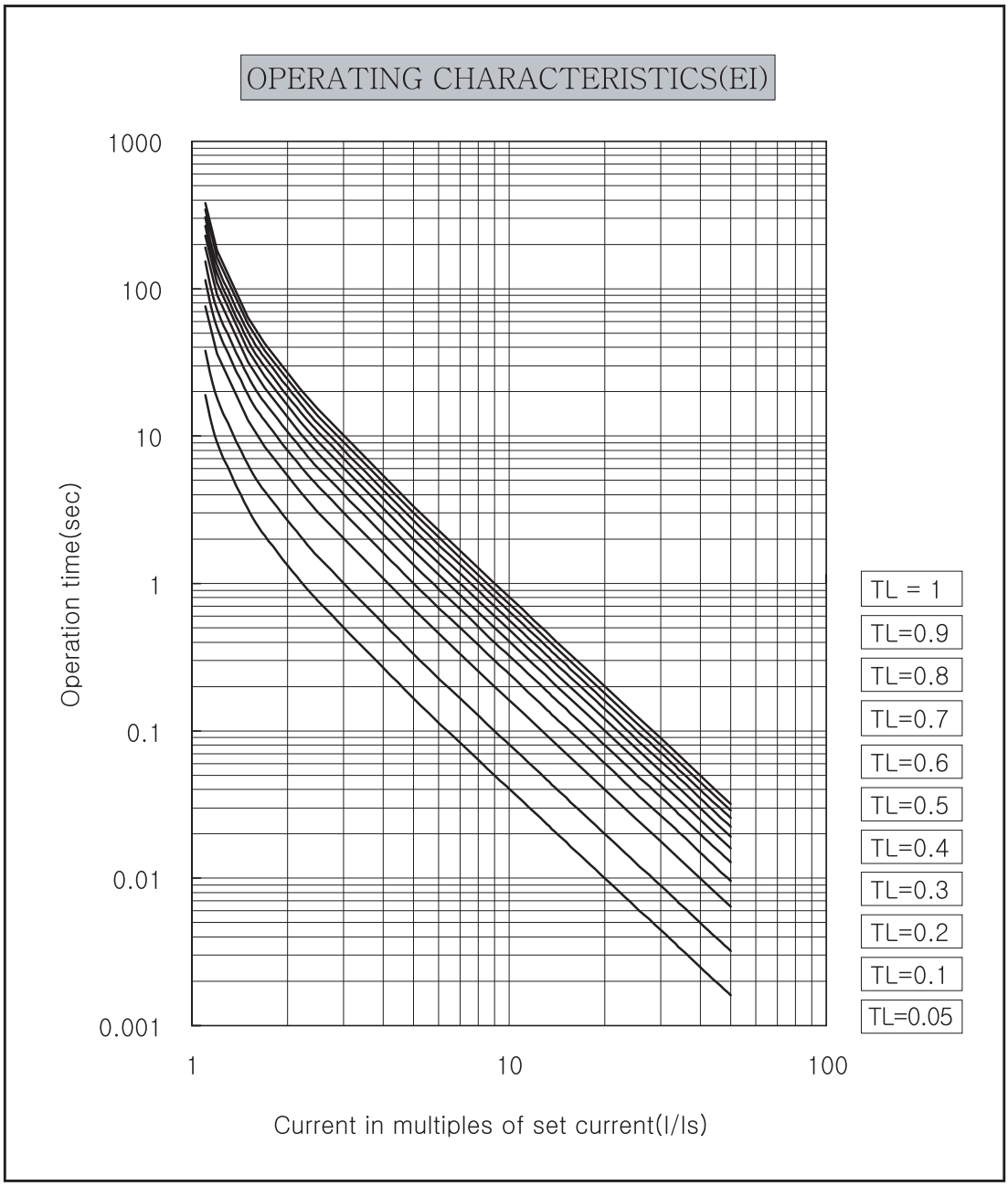
2) VI(Very Inverse Time) - OCR, OCGR

$$t = \frac{13.5}{(I / Is) - 1} \times TL \quad (TL : 0.05 \sim 1.00)$$



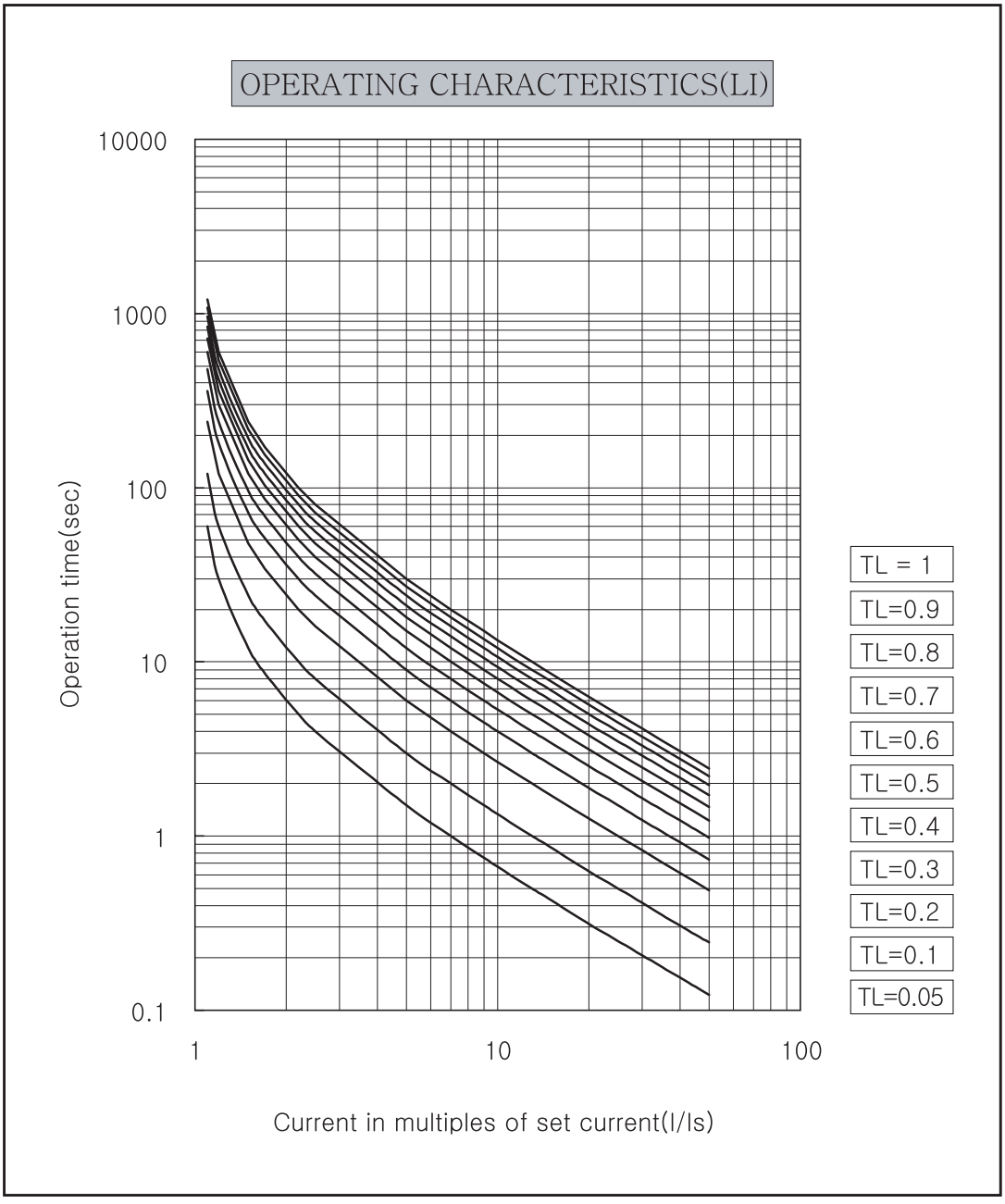
3) EI(Extremely Inverse Time)- OCR, OCGR

$$t = \frac{80}{(I / Is)^2 - 1} \times TL \quad (TL : 0.05 \sim 1.00)$$



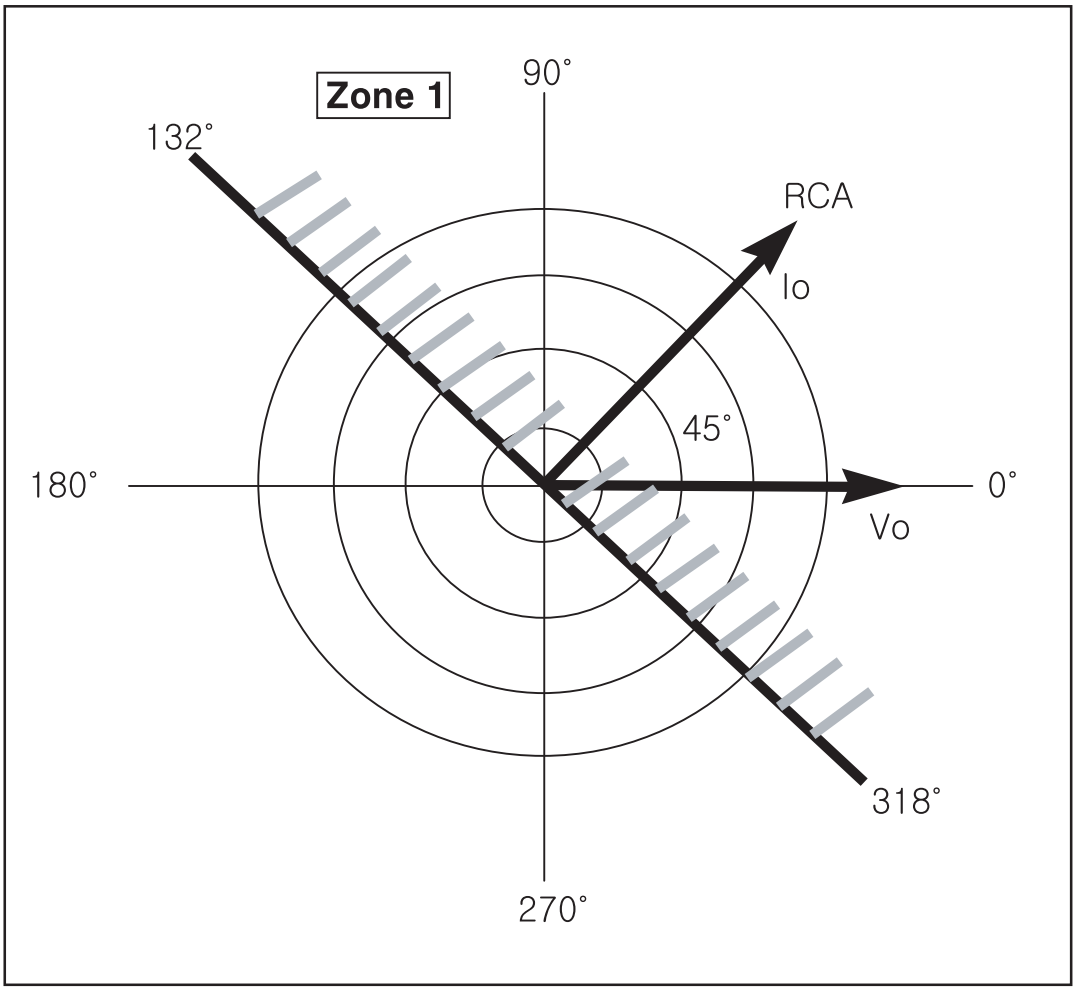
4) LI(Long Inverse Time) - OCR, OCGR

$$t = \frac{120}{(I / Is) - 1} \times TL \quad (TL : 0.05 \sim 1.00)$$



5) SGR

- Current and voltage in Zone 1 : Vo > Vos, Io > Ios
- RCA : Relay Characteristic Angle



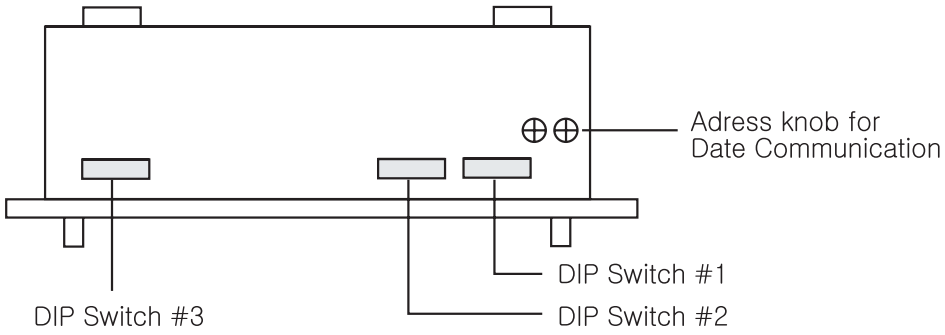
7. Installing & Operating Device

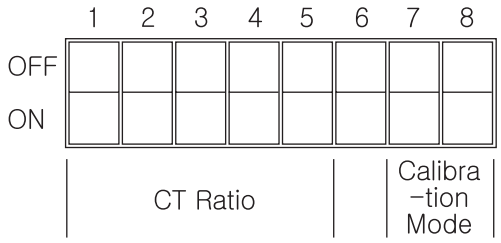
7-1. How to install

1) Set CT/PT Ratio, Wiring and select relays with DIP Switches located on the Main Board of the device.
2) Set an Address Number with the Address Knob which is deeply inside of the Main Board.
3) Supply the power (DC 110V).
4) Input the Voltage and Current.
5) By pressing the CLEAR S/W on the front, reset CB Operation, CB ON Time etc.

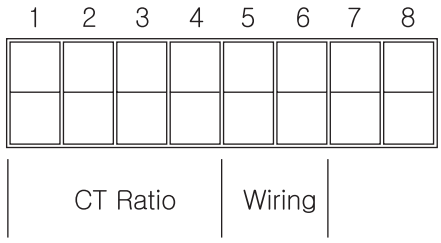
7-2. Set the DIP Switches.

Drawing out the device after taking off the screws on the front, there are four of the DIP Switches on top of the Main Board as below.

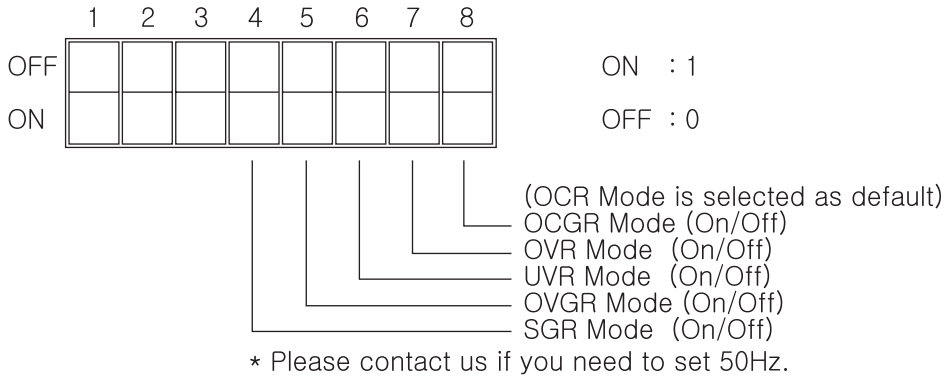




[DIP S/W #1]



[DIP S/W #2]



[DIP S/W #3]

The DIP Switches are set as follows.

1) CT Ratio CODE (Table 1)

DIP S/W #1	Setting Bits							
	1	2	3	4	5	6	7	8
5 : 5A	1	1	1	1	1			
10 : 5A	1	1	1	1	0			
15 : 5A	1	1	1	0	1			
20 : 5A	1	1	1	0	0			
25 : 5A	1	1	0	1	1			
30 : 5A	1	1	0	1	0			
40 : 5A	1	1	0	0	1			
50 : 5A	1	1	0	0	0			
60 : 5A	1	0	1	1	1			
75 : 5A	1	0	1	1	0			
80 : 5A	1	0	1	0	1			
100 : 5A	1	0	1	1	0			
120 : 5A	1	0	0	1	1			
150 : 5A	1	0	0	1	0			
200 : 5A	1	0	0	0	1			
250 : 5A	1	0	0	0	0			
300 : 5A	0	1	1	1	1			
400 : 5A	0	1	1	1	0			
500 : 5A	0	1	1	0	1			
600 : 5A	0	1	1	0	0			
750 : 5A	0	1	0	1	1			
800 : 5A	0	1	0	1	0			
1000 : 5A	0	1	0	0	1			
1200 : 5A	0	1	0	0	0			
1500 : 5A	0	0	1	1	1			
2000 : 5A	0	0	1	1	0			
2500 : 5A	0	0	1	0	1			
3000 : 5A	0	0	1	0	0			
4000 : 5A	0	0	0	1	1			
5000 : 5A	0	0	0	1	0			
6000 : 5A	0	0	0	0	1			
Calibration	Offset/Gain						1	0
Mode	Analog Input						0	1

* ON : 1, OFF : 0

2) PT Ratio CODE (Table 2)

DIP S/W #1	Setting Bits							
	1	2	3	4	5	6	7	8
110 : 110V	1	1	1	1				
220 : 110V	1	1	1	0				
380 : 110V	1	1	0	1				
440 : 110V	1	1	0	0				
3300 : 110V	1	0	1	1				
6600 : 110V	1	0	1	0				
11000 : 110V	1	0	0	1				
13200 : 110V	1	0	0	0				
13800 : 110V	0	1	1	1				
22000 : 110V	0	1	1	0				
22900 : 110V	0	1	0	1				
33000 : 110V	0	1	0	0				
66000 : 110V	0	0	1	1				
154000 : 110V	0	0	1	0				
Wiring	1P 2W				0	0		
	1P 3W				0	1		
	3P 3W				1	0		
	3P 3W				1	1		

3) Selecting Relays CODE (Table 3)

DIP S/W #1	Setting Bits							
	1	2	3	4	5	6	7	8
OCR				0	0	0	0	0
OCGR				0	0	0	0	1
OVR				0	0	0	1	0
UVR				0	0	1	0	0
OVGR				0	1	0	0	0
SGR				1	0	0	0	0
Frequency	60Hz		0					

* ON : 1 , OFF : 0

* Please contact us if you need to set 50Hz.

7-3. Setting a Communication Address Number

It is set by the two knobs on top of the Main Board and each knobs has hexa-decimal scale marks from ‘0’ to ‘F'.
Using these two knobs, it is possible to set 255 Address Numbers from '01' up to ‘FF'. For example, if '0' is set on the first(left) knob and '1' is set on the second(right) knob, then Communication

Address of this Device becomes '01'.

7-4. Check the Configuration of device (See 6-1-3.Special Function)

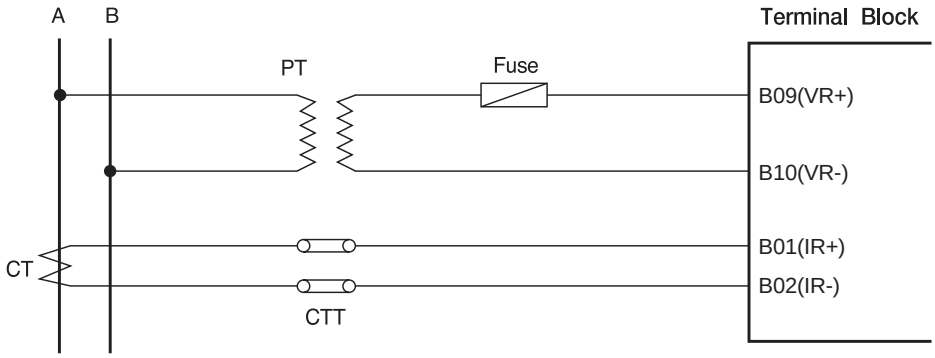
It is possible to check out the configuration data with using **FUNC** Key among the Measurement Keys on the front. When the LED of **FUNC** Key is on, you can easily check out the data by pressing V, A, F, or W Key.

1) PT Ratio
Pressing **V** key when the LED of **FUNC** Key is on, PT Ratio is displayed on the LCD.
2) CT Ratio
Pressing **A** key when the LED of **FUNC** Key is on, CT Ratio is displayed on the LCD.
3) Wiring
Pressing **F** key when LED of the **FUNC** Key is on, Wiring is displayed on the LCD.
4) Communication Address
Pressing **F** key when LED of the **FUNC** Key is on, Address Number is displayed on the LCD.

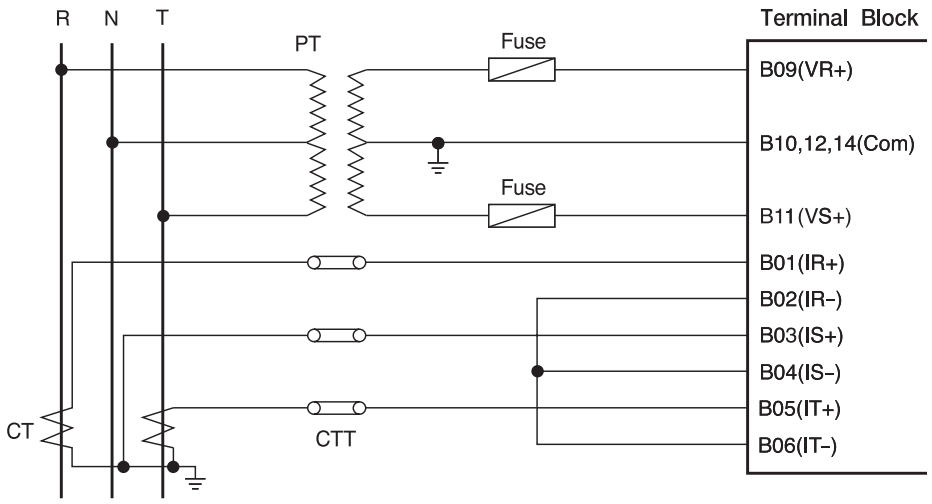
7-5. The Connection with the main line.

It differs with applied wiring systems and is connected as follows.

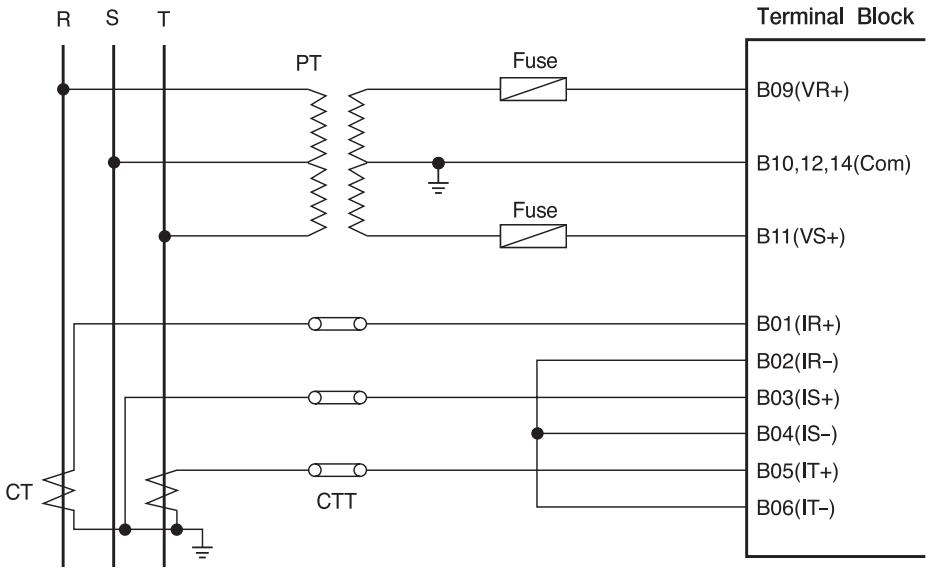
1) Sigle-Phase Two-Wire System



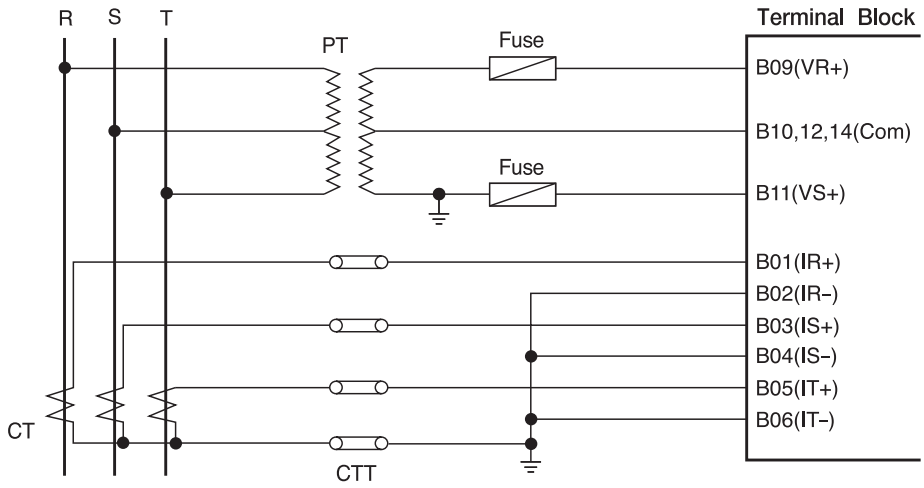
2) Sigle-Phase Three-Wire System



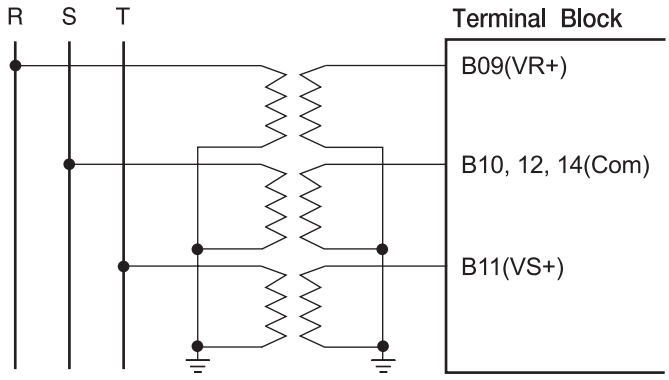
3) Three-Phase Three-Wire System (with 2-CTs)



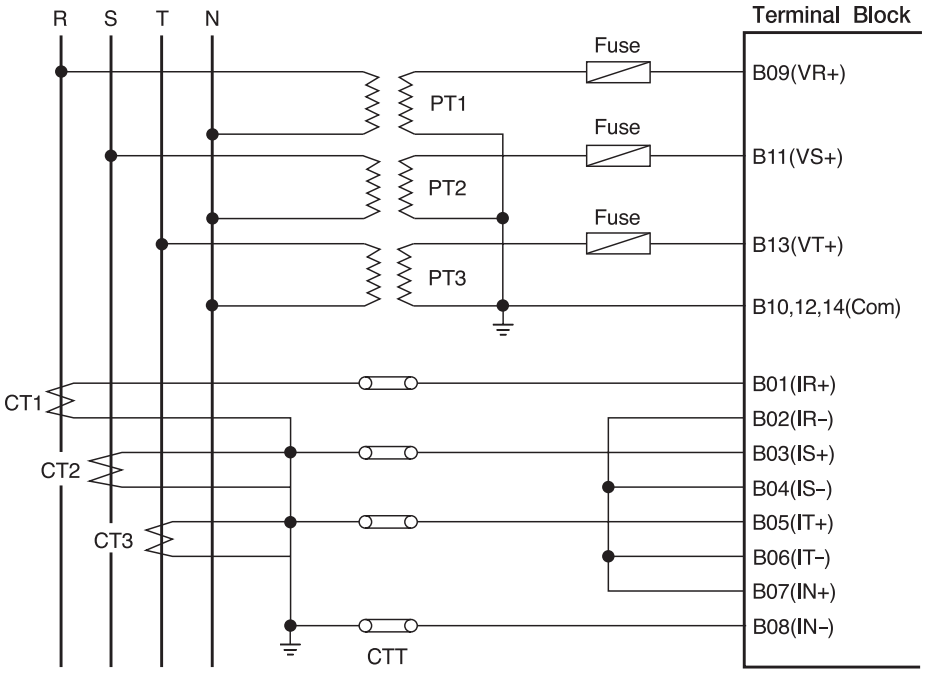
4) Three-Phase Three-Wire System (with 3-CTs)



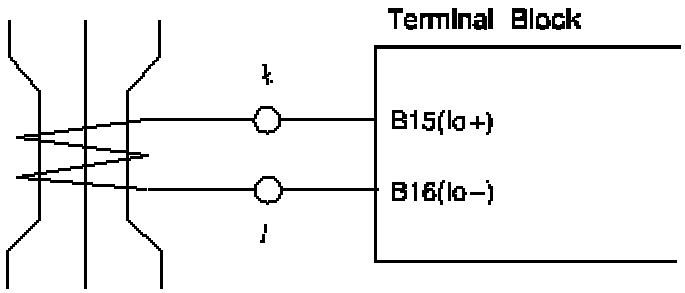
* with 3PTs



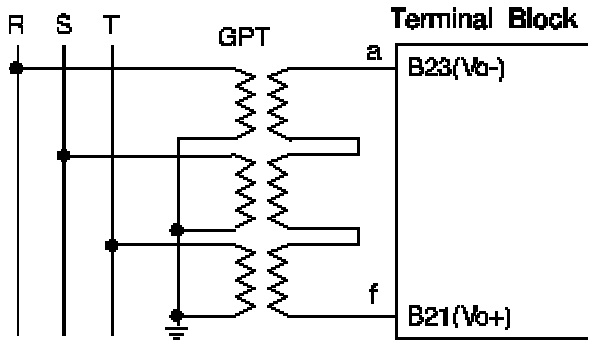
5) Three-Phase Four-Wire Syste (note.1)



6) Connecting with ZCT



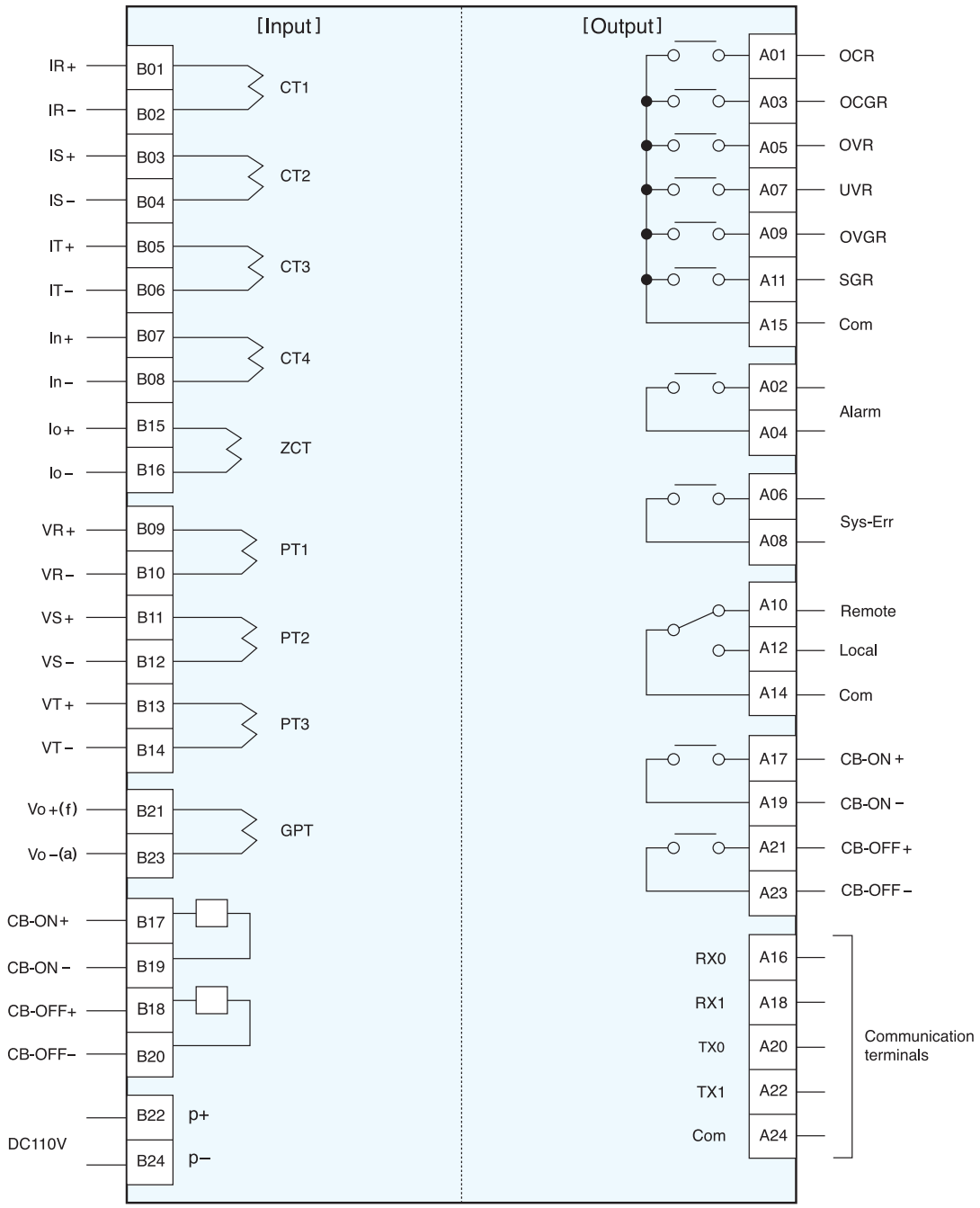
7) Connecting with GPT



7-6. External connection.

1) Avoid parallel connection with other devices that generate noises.
2) Press the CLEAR Switch to initialize all data after installing device.

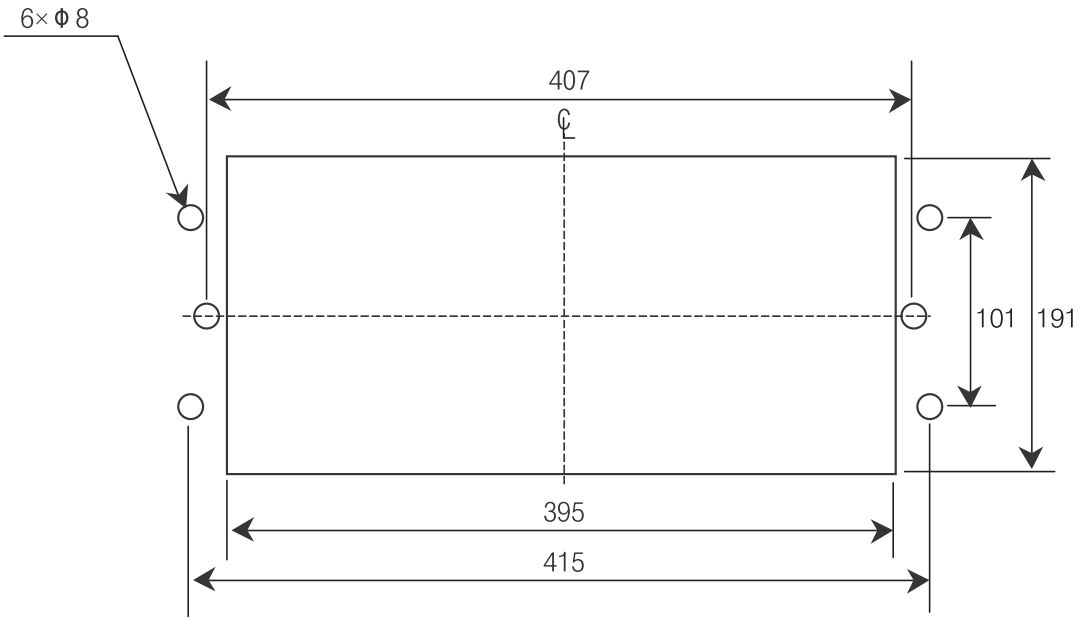
Warnings!
It must be supplied the well-smooting DC power whose ripple rate is under 6%

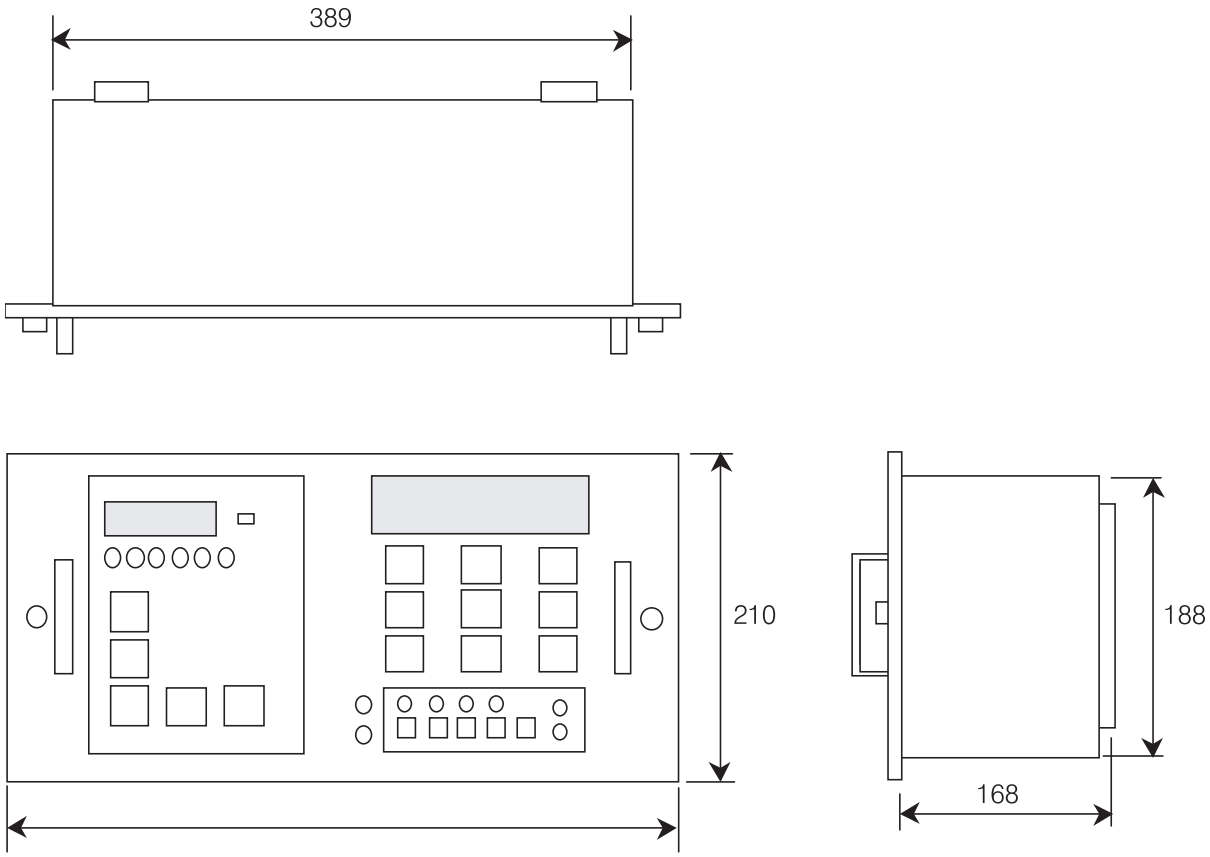


3) Terminal Block

			* Ground Terminal				* Ground Terminal
A01	OCR	A02	ALARM+	B01	IR+	B02	IR-
A03	OCGR	A04	ALARM-	B03	IS+	B04	IS-
A05	OVR	A06	SYS ERR+	B05	IT+	B06	IT-
A07	UVR	A08	SYS ERR-	B07	In+	B08	In-
A09	OVGR	A10	REMOTE	B09	VR+	B10	VR-
A11	SGR	A12	LOCAL	B11	VS+	B12	VS-
A13	-	A14	L/R COM	B13	VT+	B14	VT-
A15	COM	A16	RX0	B15	Io+	B16	Io-
A17	CB ON+	A18	RX1	B17	CB-ON +	B18	CB-ON +
A19	CB ON-	A20	TX0	B19	CB-ON -	B20	CB-ON -
A21	CB OFF+	A22	TX1	B21	Vo(f)	B22	DC +
A23	CB OFF-	A24	COMM-GND	B23	Vo(a)	B24	DC -

7-7. External Dimension(mm)





8. Communication

8-1. Communication Specific.

Serial communication with high speed and reliability using the custom LSI ASIC designed by LGIS.

1) Transmision Speed : 250kbps
2) Cable Lenth : max. 1000m
3) Insulation : Pulse Transformer
4) Connection : 4-wire Multi-drop
5) Signal Modulation : Bipolar
6) Communication Address : 0 ~ 255 (with Hexa-Decimal Switch)
7) Communication Cable : Low Capacitance LAN Interface Cable
   - SPEC : LIREV AMESB 22AWG 2-PAIR (1/0.643)
   - Impeadance : 10MHz, 120[Ω]
   - Termination : Use two terminating resistors(120Ω) at both ends of a cable.

8-2. Sequence of Event Function(Option)

If there is an occurrence of an event such as operating CB, the event is recorded with the operated time(1ms unit) in sequence so it can be easier to troubleshoot.

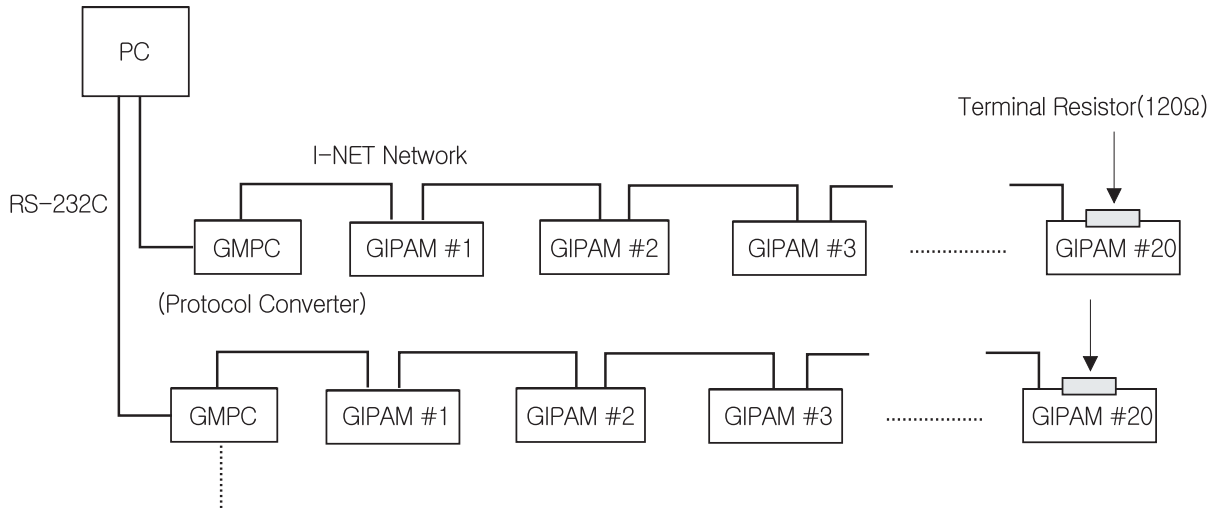
1) Event Recording

- when the relays in GIPAM has been operated (OCR, OCGR, OVR, UVR, SGR, OVGR)
- when the CB has been controlled
- when the status of the CB has been changed

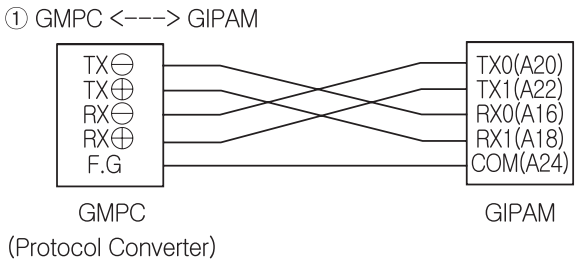
2) Synchronization

- Function of synchroinsing among the devices through the communication network.
- The occurrence of an event is recorded by 1ms unit.

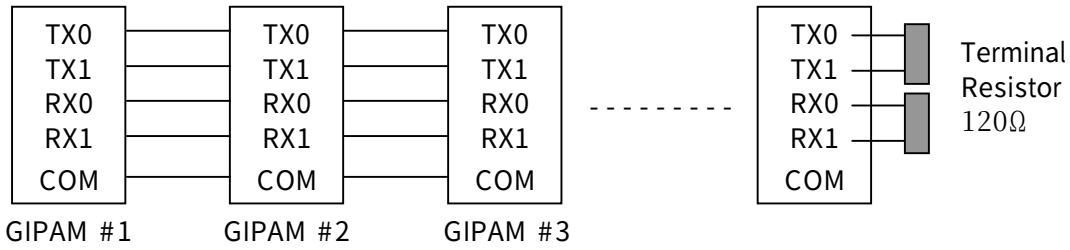
8-3. Communication Network Diagram



1) Connecting the communication Port



② GIPAM <- - -> GIPAM



9 Maintenance

9-1. Troubleshooting

NO	Condition	Cause	Proper Step
1	If all the indicators on the front have been off.	- The supplied power is under the rated Voltage(DC 110V) - The polarity of power supply is connected in the opposite.	- Trace to the cause of Voltage drop - Check out the polarity
2	If one of the Error Code is displayed on the LCD in Measuring part as below. - "ERR 0" - "ERR 1" - "ERR 2" - "ERR 3" - "ERR 4"	- PT Ratio set is wrong - CT Ratio set is wrong - Errors of Input circuit or the power in Analog circuit - an obstruction of the inside communication - CPU is out of order	- Check out DIP S/W #2 - Check out DIP S/W #1 - Check the Power circuit - Check the contact of Main CPU - Check out CPU on the main board or working voltage
3	If one of the Error Code is displayed on the LCD in Protection part as below. - "ERR 1" - "ERR 2" - "ERR 3"	- Errors of Input circuit or the power in Analog circuit - Errors of the Back-up Data (Calibration Data) - an obstruction of the inside communication (RS-232C)	- Check out the working voltage or components (Clamp Diode etc.) - Set the calibration mode again. - Check the ccontact of Main CPU]
4	Inaccuracy of displayed Voltage	- PT Fuse is down	- Check out PT Fuse
5	Inaccuracy of displayed Current	- CT rating is inappropriate	-Check out the CT rating
6	Inaccuracy of displayed power	- The phase sequence of voltage or Current is incorrect	- Check out the wiring
7	If "E.1" is displayed on the LCD in Measuring part	- Errors of Data Communication	- Check the contact of Main Board

9-2. Replacement

If it is necessary to replace a device for any reason after installation, please follow the steps below.

1) Switch off the AC power supply.
2) Disconnect the lines.
3) Take off the screws on the front and draw out the device.
4) For installing the device after replacement, take the step three to one.
5) Set CT ratio, PT ratio and wirings with DIP Switches.
6) Supply the control power(DC 110V) and check out the below.
   - An input value of the present current is displayed on LCD after all the indicators are on for a little while(0.5~0.6sec)
   - "RUN .. " is displayd on DOT-Matrix LED of the protection part.

10. Ordering Information

GIPAM - 115 N

N	Standard
S	SOE Function

[Appendix]

1. TIME CHART

1-1. Time Table for Standard Inverse(SI)

	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
200%	1.003	2.006	3.009	4.012	5.015	6.017	7.020	8.023	9.026	10.029
300%	0.630	1.260	1.891	2.521	3.151	3.781	4.411	5.042	5.672	6.302
500%	0.428	0.856	1.284	1.712	2.140	2.568	2.996	3.424	3.852	4.280
400%	0.498	0.996	1.494	1.992	2.490	2.988	3.486	3.984	4.482	4.980
500%	0.428	0.856	1.284	1.712	2.140	2.568	2.996	3.424	3.852	4.280
600%	0.384	0.767	1.151	1.535	1.919	2.302	2.686	3.070	3.453	3.837
700%	0.353	0.706	1.058	1.411	1.764	2.117	2.469	2.822	3.175	3.528
800%	0.330	0.659	0.989	1.319	1.648	1.978	2.308	2.637	2.967	3.297
900%	0.312	0.623	0.935	1.247	1.558	1.870	2.181	2.493	2.805	3.116
1000%	0.297	0.594	0.891	1.188	1.485	1.782	2.079	2.376	2.674	2.971
1100%	0.285	0.570	0.855	1.140	1.425	1.710	1.995	2.280	2.565	2.850
1200%	0.275	0.550	0.824	1.099	1.374	1.649	1.923	2.198	2.473	2.748
1300%	0.266	0.532	0.798	1.064	1.330	1.596	1.862	2.128	2.394	2.660
1400%	0.258	0.517	0.775	1.033	1.292	1.550	1.808	2.066	2.325	2.583
1500%	0.252	0.503	0.755	1.006	1.258	1.509	1.761	2.012	2.264	2.516
1600%	0.246	0.491	0.737	0.982	1.228	1.473	1.719	1.964	2.210	2.455
1700%	0.240	0.480	0.720	0.961	1.201	1.441	1.681	1.921	2.161	2.401
1800%	0.235	0.471	0.706	0.941	1.176	1.412	1.647	1.882	2.117	2.353
1900%	0.231	0.462	0.692	0.923	1.154	1.385	1.616	1.846	2.077	2.308
2000%	0.227	0.453	0.680	0.907	1.134	1.360	1.587	1.814	2.041	2.267

1-2. Time Table for Very Inverse(VI)

	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
200%	1.350	2.700	4.050	5.400	6.750	8.100	9.450	10.800	12.150	13.500
300%	0.675	1.350	2.025	2.700	3.375	4.050	4.725	5.400	6.075	6.750
400%	0.450	0.900	1.350	1.800	2.250	2.700	3.150	3.600	4.050	4.500
500%	0.337	0.675	1.013	1.350	1.688	2.025	2.363	2.700	3.038	3.375
600%	0.270	0.540	0.810	1.080	1.350	1.620	1.890	2.160	2.430	2.700
700%	0.225	0.450	0.675	0.900	1.125	1.350	1.575	1.800	2.025	2.250
800%	0.193	0.386	0.579	0.771	0.964	1.157	1.350	1.543	1.736	1.929
900%	0.169	0.338	0.506	0.675	0.844	1.013	1.181	1.350	1.519	1.688

	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
1000%	0.150	0.300	0.450	0.600	0.750	0.900	1.050	1.200	1.350	1.500
1100%	0.135	0.270	0.405	0.540	0.675	0.810	0.945	1.080	1.215	1.350
1200%	0.123	0.245	0.368	0.491	0.614	0.736	0.859	0.982	1.105	1.227
1300%	0.112	0.225	0.338	0.450	0.563	0.675	0.788	0.900	1.013	1.125
1400%	0.104	0.208	0.312	0.415	0.519	0.623	0.727	0.831	0.935	1.038
1500%	0.096	0.193	0.289	0.386	0.482	0.579	0.675	0.771	0.868	0.964
1600%	0.090	0.180	0.270	0.360	0.450	0.540	0.630	0.720	0.810	0.900
1700%	0.084	0.169	0.253	0.338	0.422	0.506	0.591	0.675	0.759	0.844
1800%	0.079	0.159	0.238	0.318	0.397	0.476	0.556	0.635	0.715	0.794
1900%	0.075	0.150	0.225	0.300	0.375	0.450	0.525	0.600	0.675	0.750
2000%	0.071	0.142	0.213	0.284	0.355	0.426	0.497	0.568	0.639	0.711

1-3. Time Table for Extreme Inverse(EI)

	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
200%	2.667	5.333	8.000	10.667	13.333	16.000	18.667	21.333	24.000	26.667
300%	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
400%	0.533	1.067	1.600	2.133	2.667	3.200	3.733	4.267	4.800	5.333
500%	0.333	0.667	1.000	1.333	1.667	2.000	2.333	2.667	3.000	3.333
600%	0.229	0.457	0.686	0.914	1.143	1.371	1.600	1.829	2.057	2.286
700%	0.167	0.333	0.500	0.667	0.833	1.000	1.167	1.333	1.500	1.667
800%	0.127	0.254	0.381	0.508	0.635	0.762	0.889	1.016	1.143	1.270
900%	0.100	0.200	0.300	0.400	0.500	0.600	0.700	0.800	0.900	1.000
1000%	0.081	0.162	0.242	0.323	0.404	0.485	0.566	0.646	0.727	0.808
1100%	0.067	0.133	0.200	0.267	0.333	0.400	0.467	0.533	0.600	0.667
1200%	0.056	0.112	0.168	0.224	0.280	0.336	0.392	0.448	0.503	0.559
1300%	0.048	0.095	0.143	0.190	0.238	0.286	0.333	0.381	0.429	0.476
1400%	0.041	0.082	0.123	0.164	0.205	0.246	0.287	0.328	0.369	0.410
1500%	0.036	0.071	0.107	0.143	0.179	0.214	0.250	0.286	0.321	0.357
1600%	0.031	0.063	0.094	0.125	0.157	0.188	0.220	0.251	0.282	0.314
1700%	0.028	0.056	0.083	0.111	0.139	0.167	0.194	0.222	0.250	0.278
1800%	0.025	0.050	0.074	0.099	0.124	0.149	0.173	0.198	0.223	0.248
1900%	0.022	0.044	0.067	0.089	0.111	0.133	0.156	0.178	0.200	0.222
2000%	0.020	0.040	0.060	0.080	0.100	0.120	0.140	0.160	0.180	0.201

1-4. Time Table for Long Inverse(LI)

	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
200%	12.000	24.000	36.000	48.000	60.000	72.000	84.000	96.000	108.000	120.000
300%	6.000	12.000	18.000	24.000	30.000	36.000	42.000	48.000	54.000	60.000
400%	4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
500%	3.000	6.000	9.000	12.000	15.000	18.000	21.000	24.000	27.000	30.000
600%	2.400	4.800	7.200	9.600	12.000	14.400	16.800	19.200	21.600	24.000
700%	2.000	4.000	6.000	8.000	10.000	12.000	14.000	16.000	18.000	20.000
800%	1.714	3.429	5.143	6.857	8.571	10.286	12.000	13.714	15.429	17.143
900%	1.500	3.000	4.500	6.000	7.500	9.000	10.500	12.000	13.500	15.000
1000%	1.333	2.667	4.000	5.333	6.667	8.000	9.333	10.667	12.000	13.333
1100%	1.200	2.400	3.600	4.800	6.000	7.200	8.400	9.600	10.800	12.000
1200%	1.091	2.182	3.273	4.364	5.455	6.545	7.636	8.727	9.918	10.909
1300%	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
1400%	0.923	1.846	2.769	3.692	4.615	5.538	6.462	7.385	8.308	9.231
1500%	0.857	1.714	2.571	3.429	4.286	5.143	6.000	6.857	7.714	8.571
1600%	0.800	1.600	2.400	3.200	4.000	4.800	5.600	6.400	7.200	8.000
1700%	0.750	1.500	2.250	3.000	3.750	4.500	5.250	6.000	6.750	7.500
1800%	0.706	1.412	2.118	2.824	3.529	4.235	4.941	5.647	6.353	7.059
1900%	0.667	1.333	2.000	2.667	3.333	4.000	4.667	5.333	6.000	6.667
2000%	0.632	1.263	1.895	2.526	3.158	3.789	4.421	5.053	5.684	6.316

GIMAC-II USER MANUAL
(Digital Integrated Metering & Control Equipment)

LG Industrial Systems

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1 Presentation

GIMAC-II is multi-functional measuring & control equipment adopt and intensify the electronic technology to the High voltage and medium voltage switchgear.

1) Compact and multi functional measuring equipment

. Measure the following electronic data only by the GIMAC-II.

3phase voltage, 3phase current, Watt, Var, Watt hour, Var hour, power factor, frequency

2) Intensify the circuit breaker control circuit to one body.

. Make the switchgear into compact size by intensify the circuit breaker control switch and on/off switch to one body.

3) Easy to modify the specification.

. If there is modifications in the main circuit specifications, the GIMAC-II correspond it by resetting the phase and line types in the electrical system by use of the dip switch.

4) Various display functions by LCD.

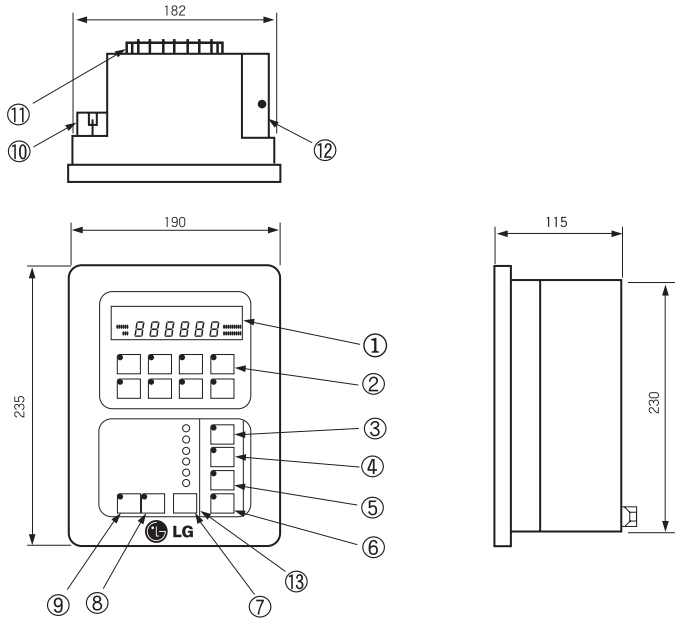
. Adopting the custom LCD (6digit + 60seg), both digital type display and analog bar graph type display are available.

5) Safety protection by the anti mis-operating covers.

. Protect the circuit breaker operation by a careless mistake.

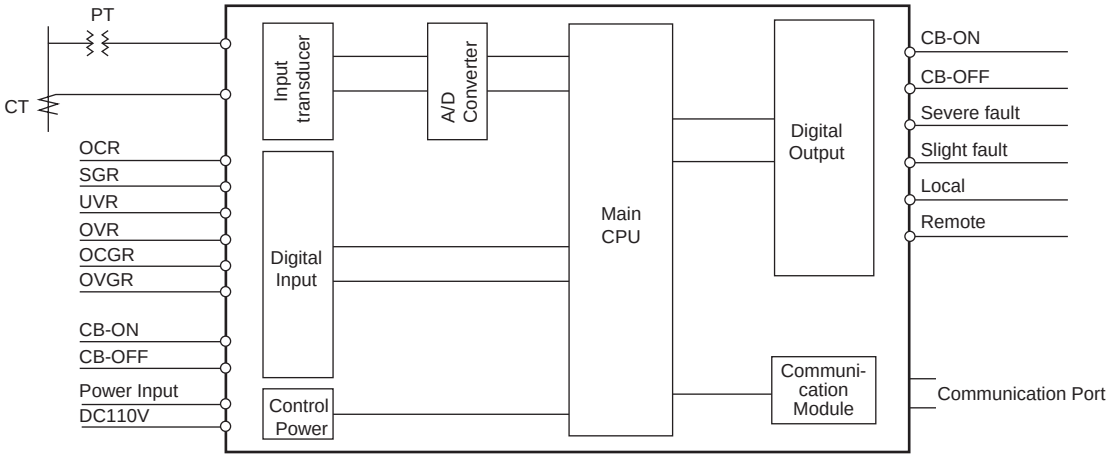
2 Features & system diagram

2-1 Features



1. LCD Display
2. Display Select Key
3. Local Key
4. Remote Key
5. CB ON Key
6. CB OFF Key
7. Fault Reset Key
8. System Check Key
9. Function Key
10. I/O Terminal Block(37Pin)
11. CT Terminal Block(6Pin)
12. Communication Unit
13. Protection Cover

2-2 System Diagram



3 Specification

3-1 Metering

1) Input

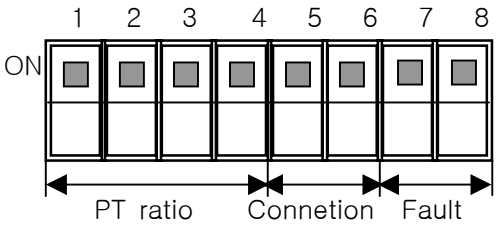
Item		Rating
Connection		1P2W, 1P3W, 3P3W, 3P4W
Input Range	Frequency	60Hz
	Voltage	AC10 ~ 132V, AC20 ~ 264V
	Current	0.2 ~ 6A

2) Display

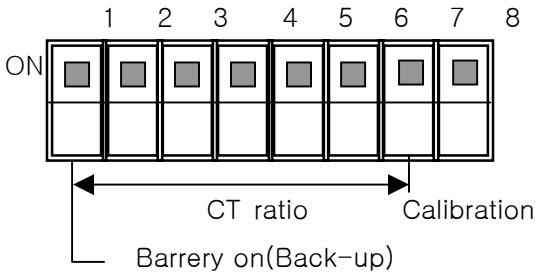
Item	Display	Range
Voltage	4 LCD	AC 10 ~ 66000V
	Bar graph	0 ~ 120 %
Current	4 LCD	AC 0.2 ~ 6000 A
	Bar graph	0 ~ 120 %
Watt	4 LCD	0 ~ 9999 MW
	Bar graph	0 ~ 120 %
Var	4 LCD	0 ~ 9999 Mvar
	Bar graph	0 ~ 120 %
Watt hour	6 LCD	0 ~ 999999 MWh
Var hour		0 ~ 999999 MVarh
Power factor	3 LCD	Lead/Lag 0 ~ 100 %
Frequence	3 LCD	45.0 ~ 65.0 Hz

3) Setting

* PT Ratio : DIP switch (#1) 4BIT
* CT Ratio : DIP switch(#2) 5BIT
* CLEAR Reset : Watt hour, CB on time, CB operation, Average power factor → Data reset



[DIP switch #1]



[DIP switch #2]

4) Specifications

Burden	Votage input	Less than 0.1VA
	Current input	Less than 1VA
Control power	Voltage	DC110V (+10 ~ -15%)
	Power	Less than 10W
Data Back-up	Min. 3 years (Lithium Battery)	
Accuracy	V, A W, Var PF F Wh, Varh	1.0 % 1.0 % 2.0 % 0.5 % 2.0 %
Operating Temperature Range Storage Temperature Range Humidity	-10 ~ 55℃ -25 ~ 75℃ 80% RH (noncondencing)	
Insulation voltage	AC 2kV(1.5kV) 1min.	
Insulation resistance	DC 500V 10 ㏁	

4 Operational functions

4-1 Display

GIMAC-II display the measuring the data by pressing the button in the lower part of the front surface

of the GIMAC-II first and then selecting the data you want.

1) Voltage

. 1phase 2wire : displays the data by Voltage unit.

. 1phase 3wires: Displays the voltage by Vrn →Vtn →Vrt sequence, at each time you press the touch switch button.

. 3phase 3wires: Displays the voltage by Vrs →Vst →Vtr sequence, at each time you press the touch switch button.

. 3phase 4wires: Displays the voltage by Vrn →Vsn →Vtn →Vrs →Vst →Vtr sequence, at each time you press the touch switch button.

2) Current

. 1phase 2wires: displays the data by Ampere unit.

. 1phase 3wires: Displays the voltage by Ir →In →It sequence, at each time you press the touch switch button.

. 3phase 3wires, 3phase 4wires: Displays the voltage by Ir →Is →It sequence, at each time you press the touch switch button.

3) POWER

. Press the touch switch button 'W' displays the power (W) and the 'VAR' button displays the power (VAR).

4) WATT HOWER

. Press the touch switch button 'WH' displays the WH and the 'VARH' button displays the VARH.

5) Power factor.

. Press the touch switch button 'PF' displays the power factor by % unit.

6) Frequency

. Press the touch switch button 'F' displays the frequency by 0.1HZ unit.

4-2 Special function switch

Enter the special function mode by pressing the 'Func switch'. If you press the 'Func switch' again

the standard mode comes. In the special function mode the followed measuring switches display the

new data as described below.

1) V switch: Display the PT ratio setting value of the dip switch in the back plate.
2) A switch: Display the CT ratio setting value of the dip switch in the back plate
3) W switch: Display the address setting value of the telecommunication unit. If there is no communication just display '- - '.
4) VAR switch: Display the number of operation time of the CB, which is connected to the CB ON input contact. .
5) WH switch: Display the let through time [hour unit] of the CB, which is connected to the CB ON input contact. When the time is over 9999 hours, it display the time by the bargraph on the 10000 hours unit.
6) VARH switch: Display all the measured data by the following sequence at few seconds intervals.

(V→A→W→VAR→WH→VARH→F→PF)

7) F switch: Display the wire connection type of the measured equipment.
8) PF switch: Display the average power factor, which was calculated by use of value of the WH & VARH

4-3 Etc.

1) Clear switch

. The clear switch in the backplate reset the WH & VARH value to "0"

. The users should press the reset button when you first install the system.

2) CPU Reset button

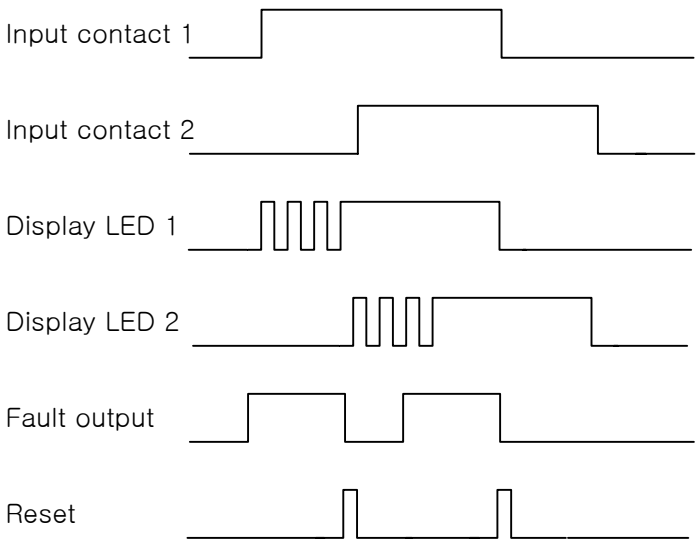
. The CPU reset switch in the backplate clear all the data in the CPU. When you found the operations

of the equipment is unusual, you can press and restart.

3) Fault Reset Switch

The alarm relays open when press 'Reset switch', located in front of equipment.

The fault LED turns off, when remove the causes of the fault.



5 Installation and operation

1) Set the followings

①CT/PT ratio by use of the DIP switch in the rear part of the equipment.

②Mis-operation display mode

③Wiring connection type

④Communication address (optional))

2) Apply the control power

3) Turn on the DIP Switch (#2) Bitl (Battery Back-up use) and press the Clear switch to initialize the

Wh/Varh value.

(When you first use the equipment you should reset the Wh/Varh value and after that the value is

stored and maintained by the backup power.)

5-1 Set the CT/PT ratio.

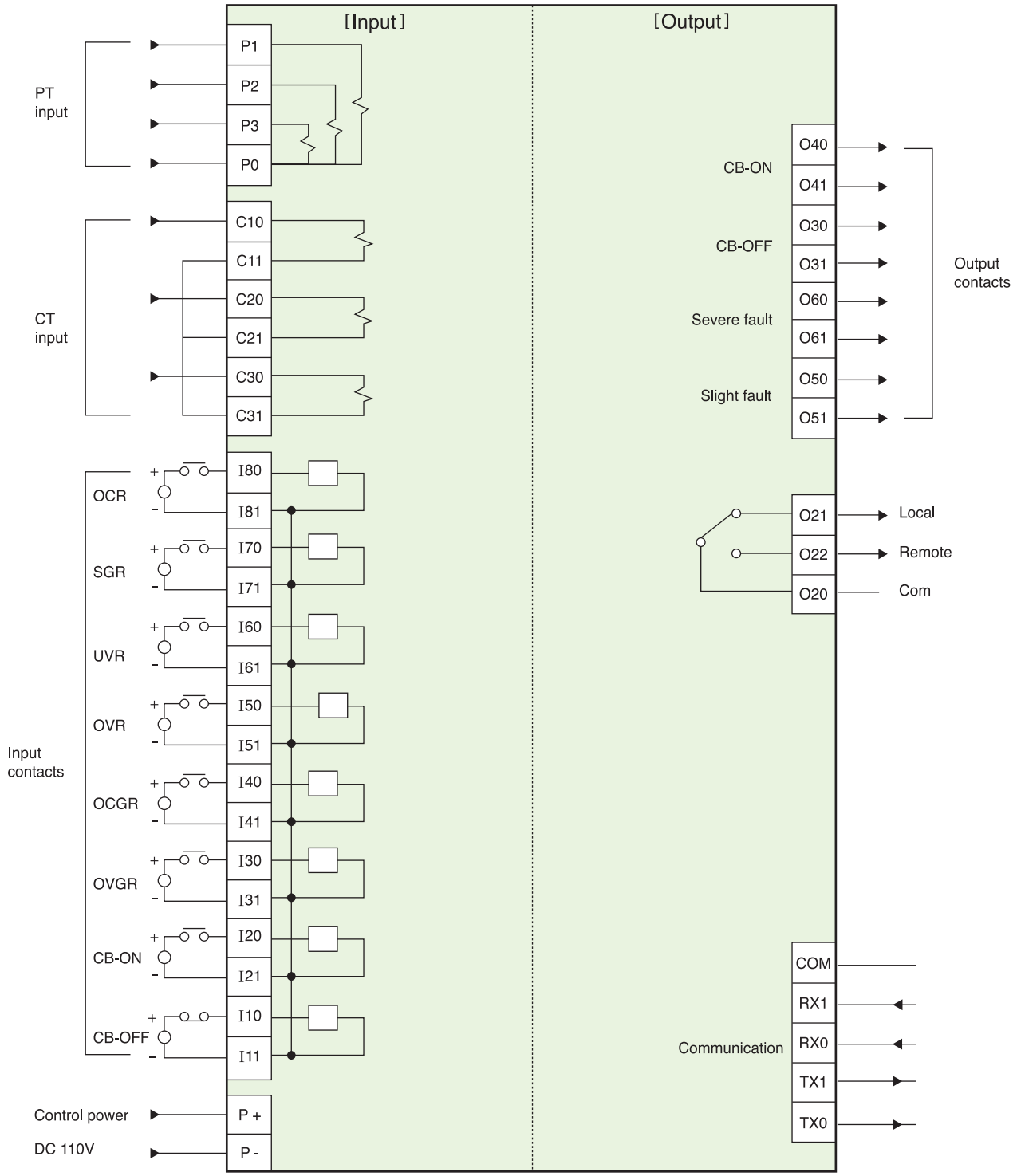
According to the CT/PT ratio, you can set the Dip switch by referring the following table.

The WH/VARH Pulse output is decided by the ratio of the CT/PT ratio.

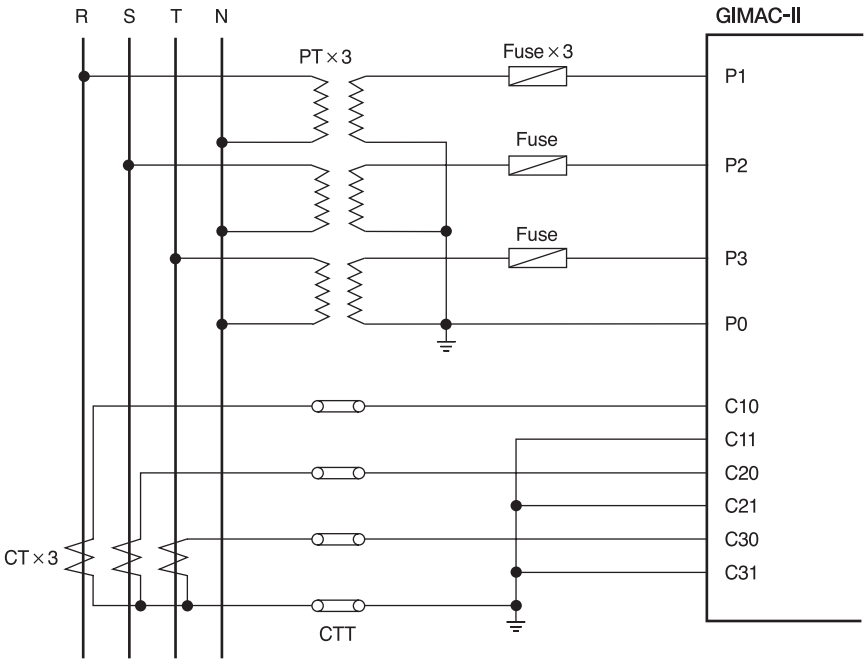
Dip S/W #1	Bit setting							
	1	2	3	4	5	6	7	8
110 : 110V	0	0	0	0				
220 : 110V	0	0	0	1				
380 : 110V	0	0	1	0				
440 : 110V	0	0	1	1				
3300 : 110V	0	1	0	0				
6600 : 110V	0	1	0	1				
11000 : 110V	0	1	1	0				
13200 : 110V	0	1	1	1				
13800 : 110V	1	0	0	0				
22000 : 110V	1	0	0	1				
22900 : 110V	1	0	1	0				
33000 : 110V	1	0	1	1				
66000 : 110V	1	1	0	0				
1P2W Connection					0	0		
1P3W Connection					0	1		
3P3W Connection					1	0		
3P4W Connection					1	1		

Dip S/W #2	Bit setting							
	1	2	3	4	5	6	7	8
5 : 5A		0	0	0	0	0		
10 : 5A		0	0	0	0	1		
15 : 5A		0	0	0	1	0		
20 : 5A		0	0	0	1	1		
25 : 5A		0	0	1	0	0		
30 : 5A		0	0	1	0	1		
40 : 5A		0	0	1	1	0		
50 : 5A		0	0	1	1	1		
60 : 5A		0	1	0	0	0		
75 : 5A		0	1	0	0	1		
80 : 5A		0	1	0	1	0		
100 : 5A		0	1	0	1	1		
120 : 5A		0	1	1	0	0		
150 : 5A		0	1	1	0	1		
200 : 5A		0	1	1	1	0		
250 : 5A		0	1	1	1	1		
300 : 5A		1	0	0	0	0		
400 : 5A		1	0	0	0	1		
500 : 5A		1	0	0	1	0		
600 : 5A		1	0	0	1	1		
750 : 5A		1	0	1	0	0		
800 : 5A		1	0	1	0	1		
1000 : 5A		1	0	1	1	0		
1200 : 5A		1	0	1	1	1		
1500 : 5A		1	1	0	0	0		
2000 : 5A		1	1	0	0	1		
2500 : 5A		1	1	0	1	0		
3000 : 5A		1	1	0	1	1		
4000 : 5A		1	1	1	0	0		
5000 : 5A		1	1	1	0	1		
6000 : 5A		1	1	1	1	0		
Battery Back-up	On	1	After installation 'ON'					
	Off	0						
Calibration			Impossible			0		
			Possible			1		

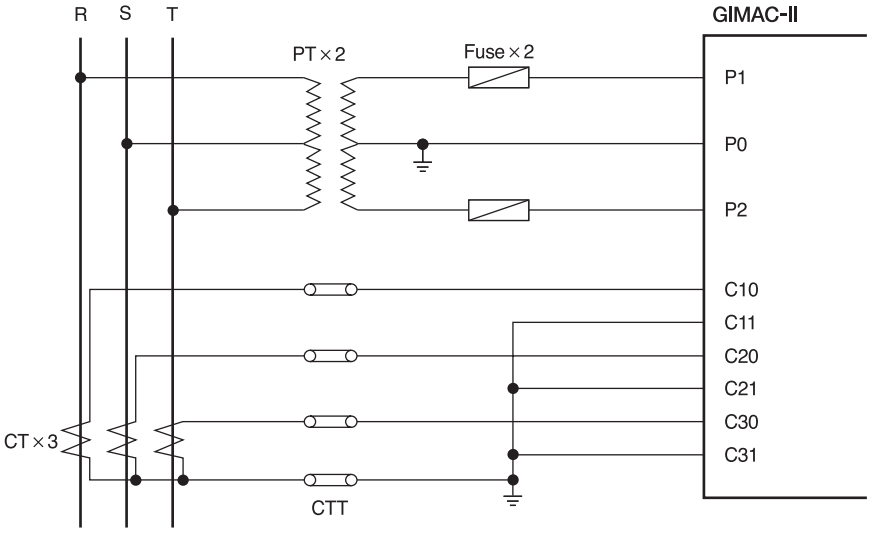
5-2 Wiring


[Input]
[Output]
PT input
CT input
Input contacts
Control power
DC 110V
P1
P2
P3
P0
C10
C11
C20
C21
C30
C31
I80
I81
I70
I71
I60
I61
I50
I51
I40
I41
I30
I31
I20
I21
I10
I11
P +
P -
OCR
SGR
UVR
OVR
OCGR
OVGR
CB-ON
CB-OFF
O40
O41
O30
O31
O60
O61
O50
O51
CB-ON
CB-OFF
Severe fault
Slight fault
Output contacts
O21
O22
O20
Local
Remote
Com
COM
RX1
RX0
TX1
TX0
Communication

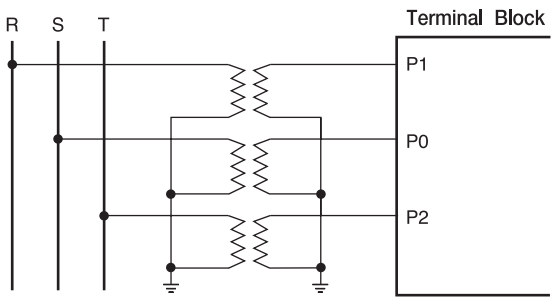
1) 3P4W (3-CT)



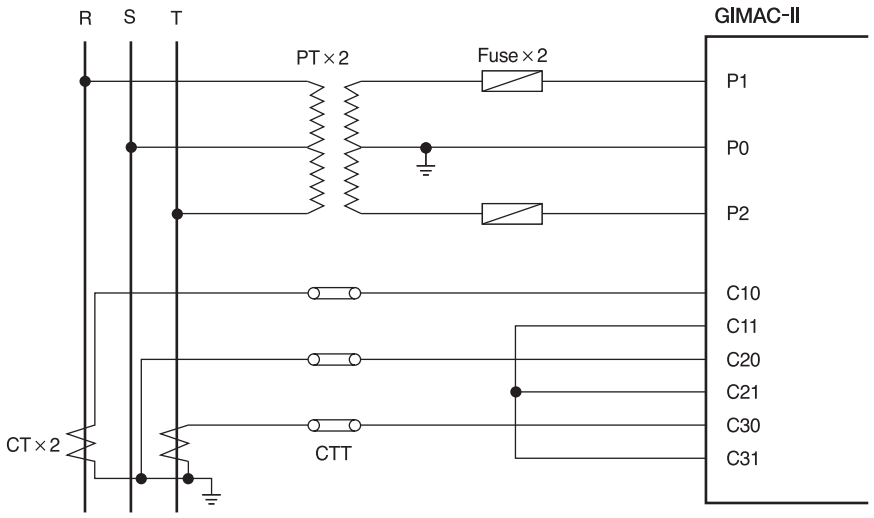
2) 3P3W (3CT)



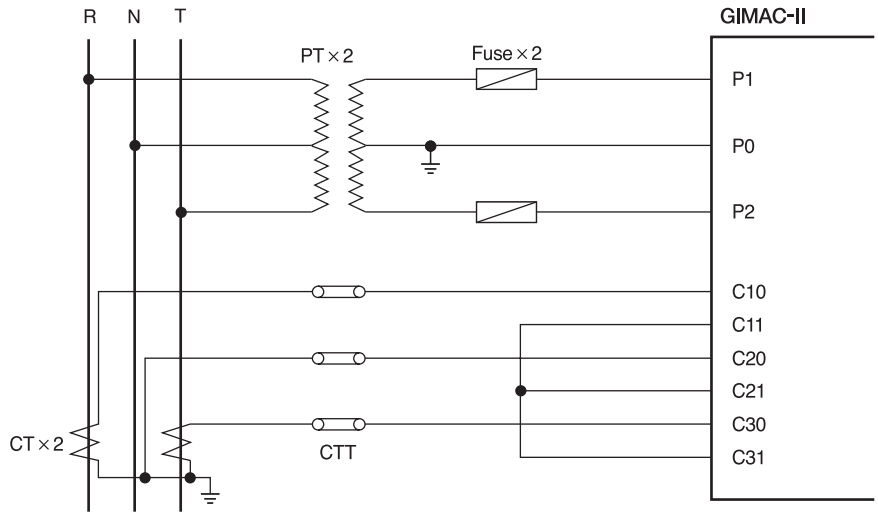
* With 3PTs



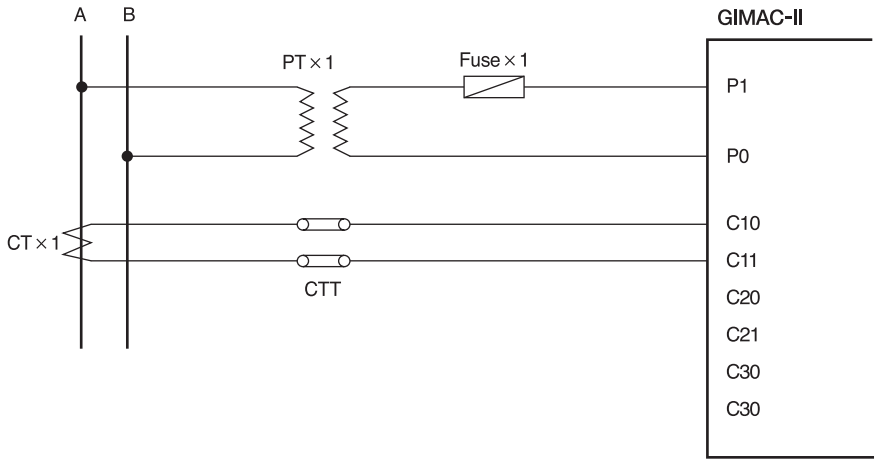
3) 3P3W (2CT)



4) 1P3W



5) 1P2W



6 Odering Information

GIMAC **1** **1** **5** **N**

1: GIMAC-II

Control voltage	
1	DC 110V
2	DC 220V

Meausring items	
5	Integrated type

Transformer ratio type	
N	With standard CT & PT ratio
S(PT)	With non-standard PT ratio
S(CT)	With non-standard CT ratio

GMPC-III USER MANUAL
(Protocol converter-III)

LG Industrial Systems

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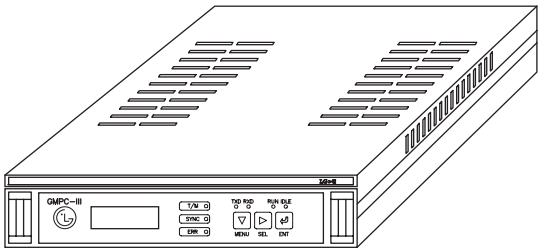
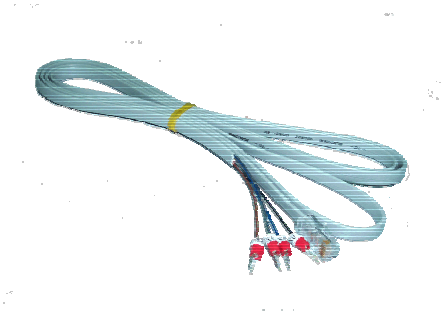
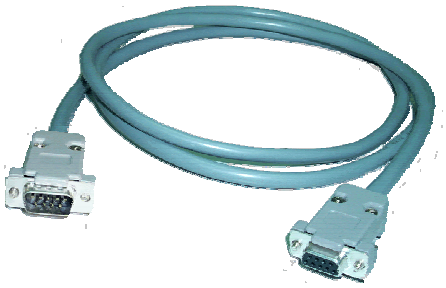
1 Components



GMPC-III Main Body (1EA)

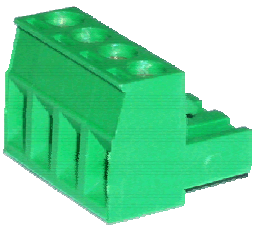


I-NET CABLE (1EA)



RS232C CABLE (1EA)

POWER CALBE (1EA)

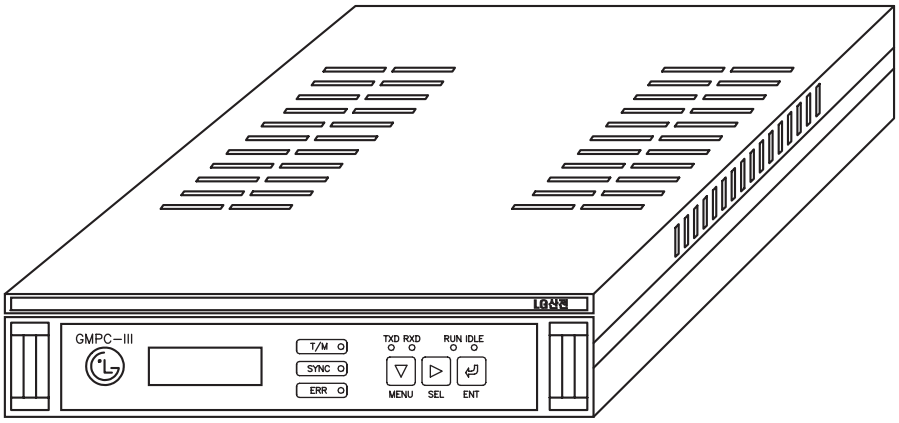


485 Connector

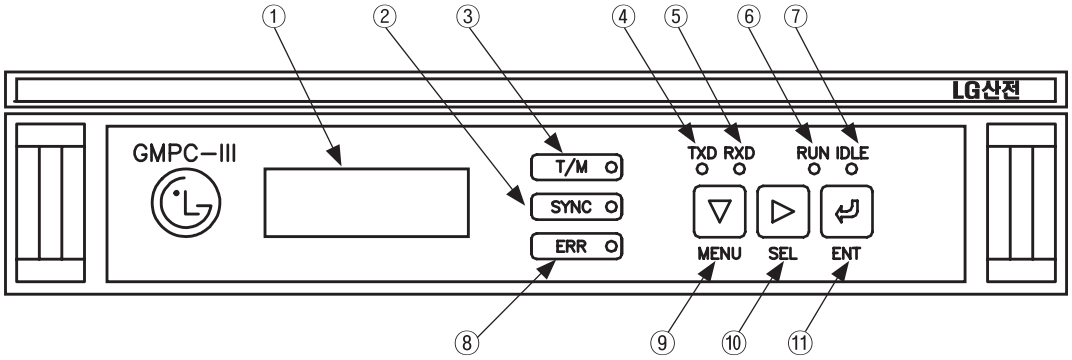
T/M Connector

2 Overview

2.1 General View



2.2 Front Face View



① Display Window

- Displaying time and setting menu

② SYNC LED

- Being on-and-off while a synchronizing data is transmitting.

③ Time Master LED

- Turned on when Time Master is selected in the setting menu

④ TxD LED

- Turned on while a data is transmitting with RS-232 or RS-485 port

⑤ RxD LED

- Turned on while a data is receiving with RS-232 or RS-485 port

⑥ RUN LED

- Turned on when there is a data flow on I-Net port

⑦ IDLE LED

- Turned on when there is not any data flow on I-net port

⑧ Error LED

- Turned on when any error is on the internal system

⑨ MENU Key

- Changing the setting menu

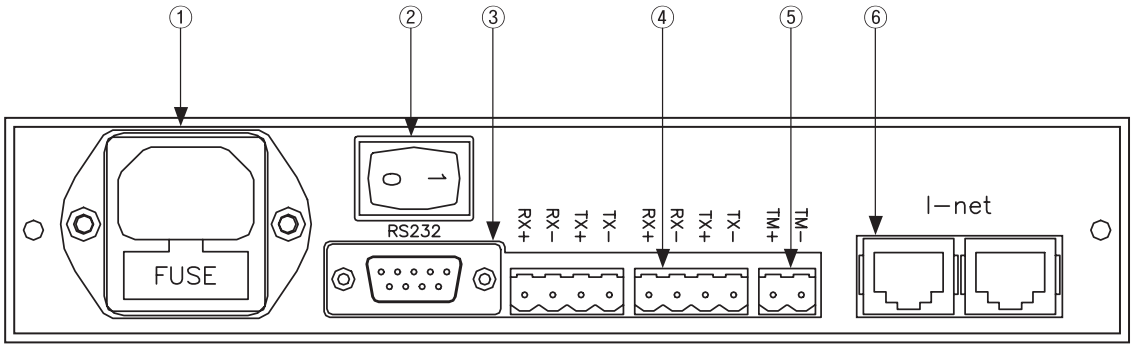
⑩ SELECT Key

- Changing the setting value

⑪ ENTER key

- Storing the changed value

2.3 Rear View



① Power Connector & Fuse

② Power Switch

③ RS-232 Serial Port (D-SUB Male 9Pin)

④ RS-485 Port

⑤ Time Master

- The port for synchronization among GMPCs

⑥ I-net port

3 General Description

3.1 Introduction

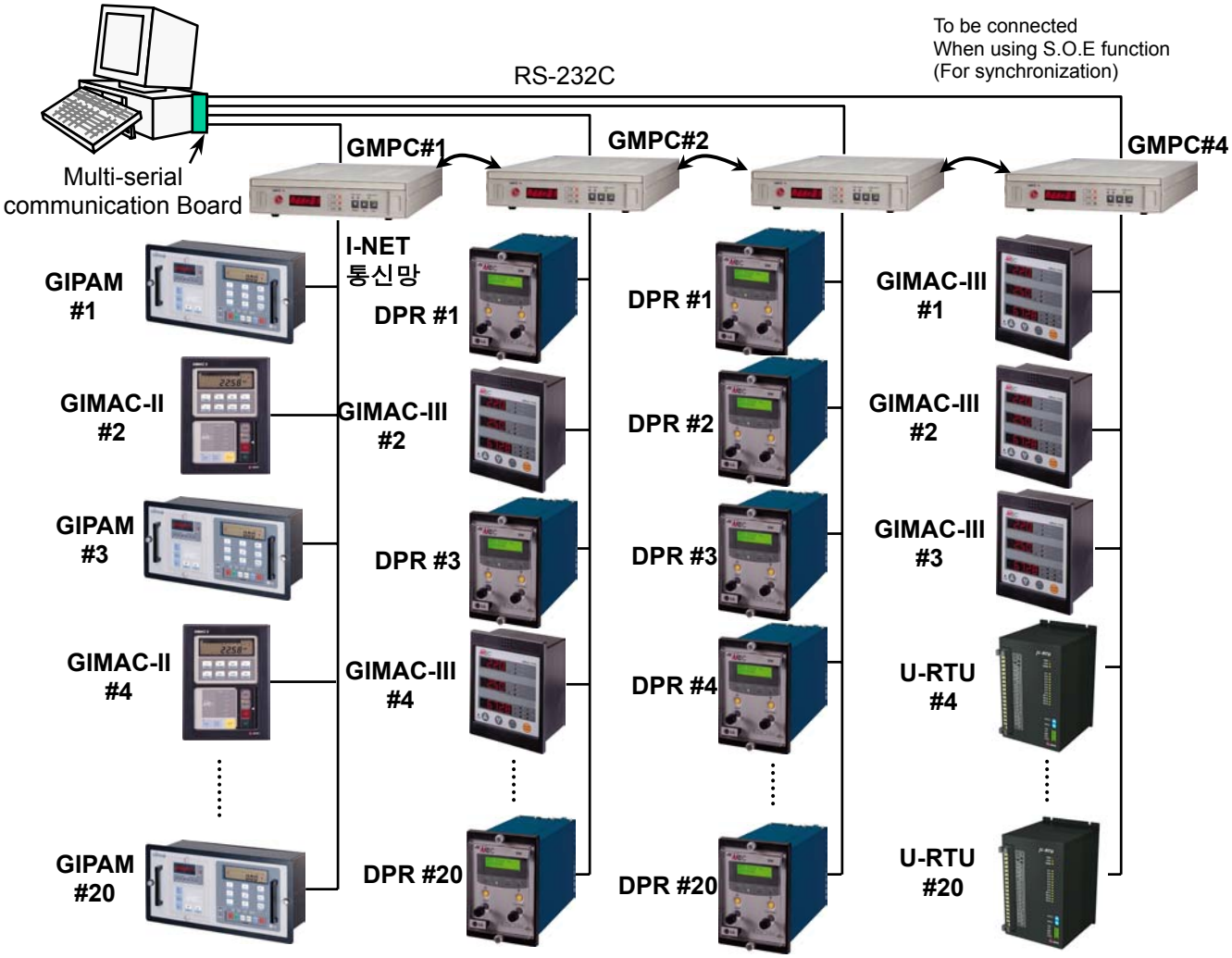
GMPC-III is a interfacing equipment which makes possible to communicate between the devices using I-Net standard (Exclusive communication method or standard of LGIS) such as GIMAC or GIPAM and the devices using any other communication standard or protocols. GMPC has RS-232, RS-422 and RS-485 port for it and enables I-Net data to convert RS-232, RS-422 or RS-485 one, that is, GMPC has a function that makes it capable to communicate among the devices accepting different protocol with converting not only a data from remote control system to I-Net data but also converting I-Net one to the one used remote system.

In particular, GMPC provides MODBUS protocol of MODICON which is widely accepted in the industry so that it is capable to interface the devices or control & monitoring system using MODBUS protocol.

GMPC supports the function called S.O.E(Sequence Of Event) of GIPAM. It receives information about time from Time-Master which is selected on the network and broadcast it all over the slave devices. GMPC makes the devices maintain to be synchronized on the I-Net Network and there is no interference except for transmitting delays within several milli-seconds between I-Net devices and central control & monitoring system.

4 system Configuration

4.1 Network Diagram



4.2 Standards for system configuration

Installation between GMPC and remote control & monitoring system is permitted point to point topology on the network adopting RS-232 or RS-485 connection.

The Multi-drop network configuration has to be applied between the GMPC.

For synchronization, GMPC is capable to be connected up tp16ea (maximum) and one of them has to be selected as Time Master.

5 Functions

5.1 Interfacing with Central control & monitoring system.

GMPC has RS-232 and RS-485 port which applies asynchronous mode for interfacing with Central control & monitoring system. It is capable to set all parameters about transmission such as transmission speed for RS-232 and RS-485 port. Because there is a control signal for modem, it is possible to use external modem via RS-232 port. It is electrically insulated between the external serial ports(RS-232 or RS-485 port etc.) and internal electronic circuits to provide accurate environmental condition.

5.2 Interface for I-NET communication

- GMPC has two of serial ports which support multi-connection for I-Net communication and it is possible to set I-Net address for each devices.

5.3 Synchronization

5.3.1 Synchronizing between GMPC and the remote control system.

GMPC which is set as Time Master receives information about time from the remote control system and set the timer built-in for the time data received.

- For synchronization, it is capable to use 1[s] or 1[ms] unit one. For more detailed information refer to section 7.4 " Synchronization mode."

5.3.2 Synchronizing between the GMPCs.

By means of broadcasting time data which is stored on the inside timer of Time-master GMPC, synchronization is carried out among the slaves ones.

All of the slave GMPCs, not selected as the Time-Master, receive time data from the Time-Master one and synchronize their own timer built-in. The accuracy of synchronization is within 0.5ms when all of the GMPCs are connected directly.

- There is a separated serial port (RS-485 connection) on the GMPC for this synchronization .

5.3.3 Synchronizing via I-Net communication

GMPC broadcasts the stored information about time via I-Net serial port frequently so that it is possible to keep synchronizing all the devices connected on the I-Net network. For more information about data frame for synchronization via I-Net communication, refer to Chapter 9.

5.4 Displays and Settings

5.4.1 GMPC is able to display the items in the table as below.

Displayed Parameters	Details
Status of the Device	Normal or Error Code
The Present Time	Year/Month/Day/Min./Sec.
Selecting a TIME MASTER	Selecting / Remove
SYNC. BROADCAST	Selecting / Remove
I-NET ADDRESS	0x00 ~ 0xFF
Choosing a PROTOCOL	MODBUS / GMPC(I-NET)
RS232 / RS485	RS232 / RS485
Setting the PARITY BIT	No / Odd / Even
Communication Speed	2400 - 57600 bps
Condition of the TIME MASTER	T/M LED
Synchronizing between the GMPCs	SYNC LED
Self-Diagnostic	ERR LED
Communication Status	TXD, RXD LED
Communication Status (I-Net)	RUN, IDLE LED

5.4.1 It is capable to monitor the items in the following table on the Remote Control Center via GMPC.

Displayed Parameters	Details
Status of the Device	Normal or Error Code
The Present Time	Year/Month/Day/Min./Sec.
Selecting a TIME MASTER	Selecting / Remove
SYNC BROADCAST	Selecting / Remove
Synchronizing between the GMPCs	Selecting / Remove
I-NET ADDRESS	0x00 - 0Xff
RS232 / RS485	RS232 / RS485
Communication Speed	2400 - 57600 bps

5.4.2 It is capable to set the following items in the table via the front panel of the GMPC.

Setting Parameters	Setting Range
The Present Time	Year/Month/Day/Min./Sec.
Selecting a TIME MASTER	Selecting / Remove
SYNC BROADCAST	Selecting / Remove
I-NET ADDRESS	0x00 ~ 0XFF
Choosing a PROTOCOL	MODBUS / GMPC(I-NET)
RS232 / RS485	RS232 / RS485
Setting the PARITY BIT	No / Odd / Even
Communication Speed of RS232 / 485 standards. (8 Data Bits, No Parity, 1 Stop Bit)	2400
	4800
	9600
	14400
	19200
	28800
	33600
	38400
	56000
	57600

5.4.3 It is capable to set the following items in the table via the Remote Control Center.

Setting Parameters	Setting Range
The Present Time	Year/Month/Day/Min./Sec.
Selecting a TIME MASTER	Selecting / Remove
SYNC BROADCAST	Selecting / Remove
I-NET ADDRESS	0x00 ~ 0XFF

6 Expression Of Time Data

6.1 Expressing Data of the timer built-in.

6.1.1 Time SYNC. Frame for Time synchronization on I-Net Network.

A time information is displayed 32bits-time data in the form of 0[h] 0[m]0.000[s] and it is reset once a day.

The form of Sync. Frame is as below.

0XFF(COMMAND)
Time Byte 3(MSB)
Time Byte 2
Time Byte 1
Time Byte 0(LSB)

6.1.2 Time SYNC. Frame for synchronizing between the GMPCs.

Being defined separately

6.1.3 Time SYNC. Data from the computer of remote control system.

If the computer system is selected as a Time master, it provides synchronizing with the GMPC by means of Time SYNC. Protocol which is defined separately.

If one of the GMPC is selected as a Time Master, computer system provides time data for GMPC and the GMPC makes inside timer be synchronized with the time data from the computer system. However the timer built in the GMPC is possible not to be tuned by the milli-second unit but by the second unit, That is, time data from the computer system is used for synchronizing by the second unit but it has not influence on synchronization for all over the computer system.

7 Environmental Characteristic

Items	Details
Control Power	AC 110V - 220V±20%, 50/60Hz
Power Consumption	< 10 W
Operating Temperature	-10℃~ 50℃
Operating Humidity	90 %RH, Non-Condencing
Insulation Voltage	AC 2kV for 1 minute

8 Installation

8.1 The first installation

8.1.1 Connecting to the power.

GMPC has two different type which means the RACK Type and the UNIT type and both of them are supplied AC110-220V(Free Voltage) as a control power.

The power cable has to be connected to the plug at the rear of the device.

The rated voltage and current of the fuse which is inside of the Fuse Holder on the rear of the Unit Type should be checked if it is 220V and 2A.

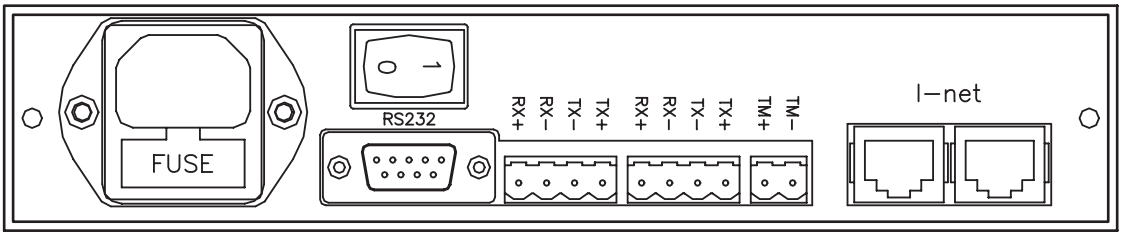
It has to be checked that the power switch is turned on.

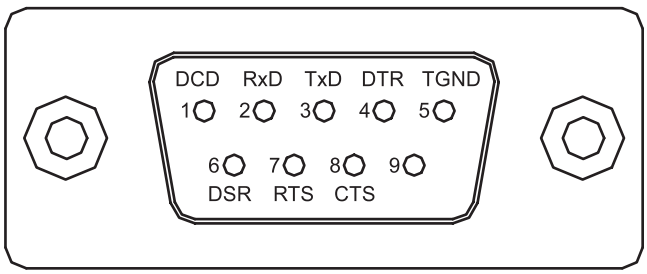
8.1.2 The connection of a communications line.

GMPC has communication ports for transmitting data to the Host System which means the computer of the Remote Control & Monitoring system and it can be selected either RS-232 or RS-485.

The port that is above-mentioned is plugged into the connecter(9 PIN D-SUB MALE TYPE) on the rear.

RS-232 makes use of DTE connection and the rear view is as below.

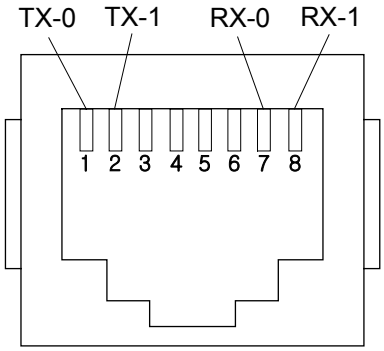




RS-232 Connector

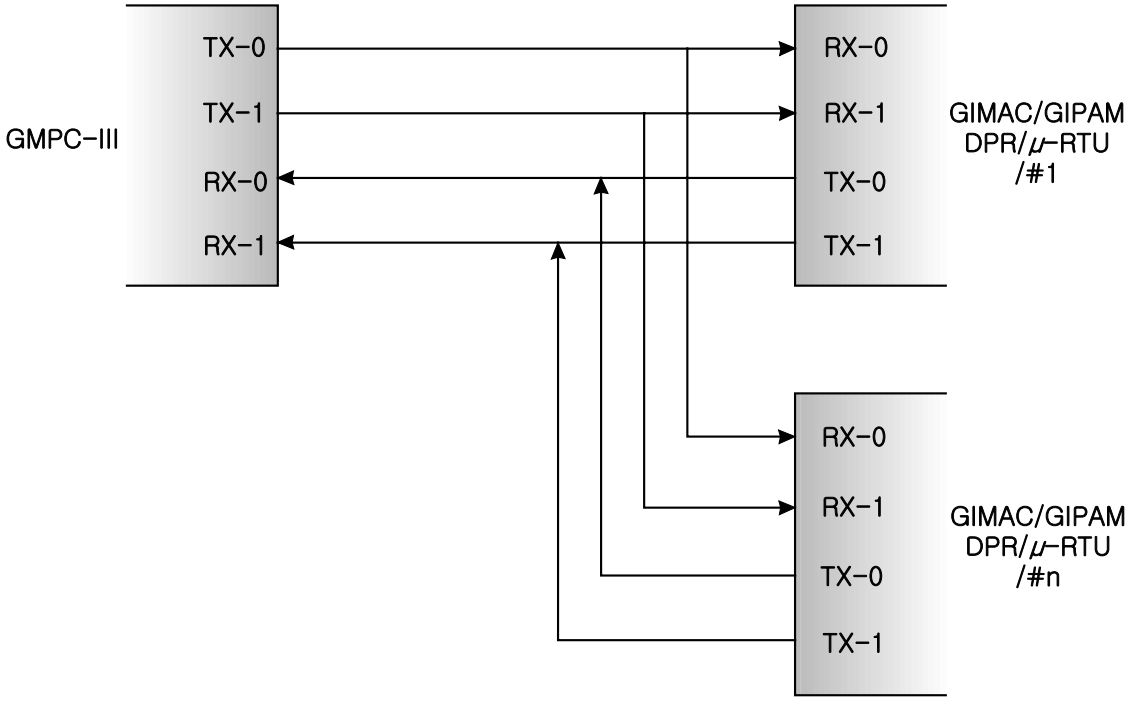
8.1.3 The Connection of I-Net cable

GMPC also has communication ports for I-Net communicating with GIMAC and GIPAM and for wiring, it is necessary to be used Multi-drop network configuration with 4 wires as below.



I-NET Connector

UNIT Type	
1	TX-0
2	TX-1
7	RX-0
8	RX-1



8.1.4 The connection of auxiliary connectors

GMPC has a function called S.O.E.(Sequence Of Event) which means to synchronize among a number of GMPCs. In order to use this function, all the TM+/TM- terminals that each device has should be plugged in with two wires.

8.2 The first settings

8.2.1 SELF TEST

When GMPC is supplied the power, it carries out a self test within 2 or 3 seconds and changed into ERROR DISPLAY Mode.

If there is not any errors on the device, it turns over into TIME DISPLAY Mode.

8.2.2 ERROR DISPLAY

It can be only displayed one of the Error Codes on the front window when an error is on the device.

Error Code

Error 1 : An error while transmitting I-Net Data

Error 2 : An error about time data

Error 4 : An error on Serial communication Line(RS-232/485)

To move to the next menu, press the **[MENU] key**.

8.2.3 HOUR/ MINUTE / SECOND DISPLAY

The Front window displays the present hour/minute/second.

Pressing the **[SEL]key** once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. To increase this value press the **[SEL]key.**

Reaching the value you wish to change, press **[ENT]key** to move to the next step.

To store all the values changed, press the **[ENT]key** at the last menu and then the display window is changed into Display Mode automatically.

If you press the **[MENU] key** while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the **[MENU]key.**

8.2.4 YEAR / MONTH / DAY DISPLAY

The Front window displays the present year/month/day.

Pressing the [SEL]key once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. To increase this value press the [SEL]key.

Reaching the value you wish to change, press [ENT]key to move to the next step.

To store all the values changed, press the [ENT]key at the last menu and then the display window is changed into Display Mode automatically.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.5 TIME MASTER DISPLAY

The front window displays whether it is selected as Time Master or not.

Pressing the [SEL]key once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. And each time pressing the [SEL]key, it goes On to Off or vise versa.

To store the status selected between On and Off, press the [ENT]key.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.6 SYNC BROADCAST DISPLAY

The front window displays whether it broadcasts time synchronous data to the connected devices using I-Net communication or not.

Pressing the [SEL]key once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. And each time pressing the [SEL]key, it goes On to Off or vise versa.

To store the status selected between On and Off, press the [ENT]key.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.7 I-NET ADDRESS DISPLAY

The front window displays an I-Net address of GMPC.

Pressing the [SEL]key once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. To increase this value press the [SEL]key.

Reaching the value you wish to change, press [ENT]key to store it and then the window is changed into Display Mode automatically.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.8 Selecting a Protocol

Either MODBUS or I-Net protocol is selected in this menu by means of the one adopted on the SCADA system.

To move to the menu selecting a protocol, press [MENU]key. And each time pressing the [SEL] key, it displays GPMC or MODBUS on the window one by one.

To store the one selected between GMPC and MODBUS, press the [ENT]key.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.9 RS-232 / RS-485 DISPLAY

Either RS-232 or RS-485 is selected in this menu for serial communication with the SCADA system.

Pressing the [SEL]key once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. And each time pressing the [SEL] key, it displays RS-232 or RS-485 on the window one by one.

To store the one selected between RS-232 and RS-485, press the [ENT]key.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.10 Parity Bit Setting

Parity is set in this menu.

To move to the menu setting parity, press [MENU]key. And each time pressing the [SEL] key, it displays no, odd or even on the window one by one.

To store the one selected among them, press the [ENT]key.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.2.11 BAUD RATE DISPLAY

The front window displays speed for serial communication.

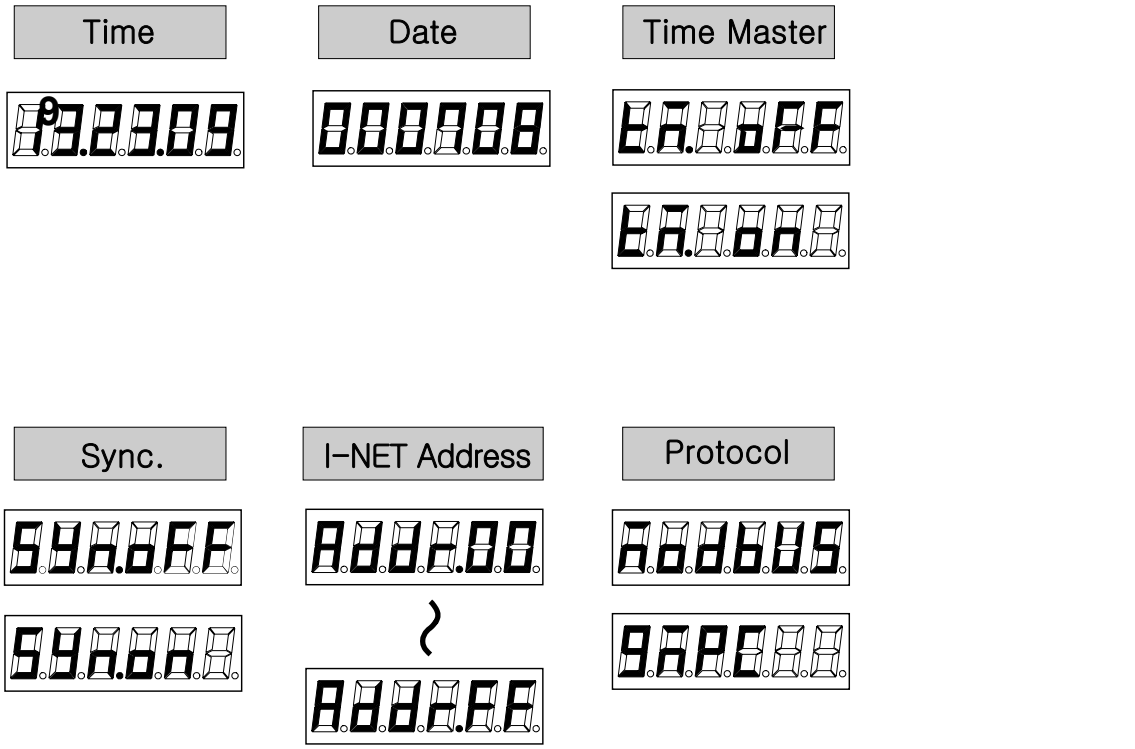
Pressing the [SEL]key once, it is changed from Display Mode to Setting Mode and the value on the display window goes on and off. To increase this value press the [SEL]key.

Reaching the value you wish to change, press [ENT]key to store it and then the window is changed into Display Mode automatically.

If you press the [MENU] key while changing the values on the setting menu, all the values that has been changed are canceled and it is changed into Display Mode.

To move to the next menu on Display Mode, press the [MENU]key.

8.3 MENU TREE


Time
Date
Time Master
Sync.
I-NET Address
Protocol
RS-232/RS-485
Parity Bit
Baud rate

9 Protocols

9.1 Introduction

GMPC transfers the data from Central Control & Monitoring system(PC/MODEM) to subordinate devices such as GIMAC/GIPAM if there is a response from them or vise versa. And a structure of the data which is communicated between Central Control & Monitoring System and subordinate devises will be defined in this chapter.
Meanwhile the other type of structure which is necessary to read status or change setting value of GMPC is also defined in this chapter separately.

9.2 Basic structure of data frame for transmission.

Data that flows between GMPC and the Host system is transmitted frame by frame and the basic structure of a frame is as follow.

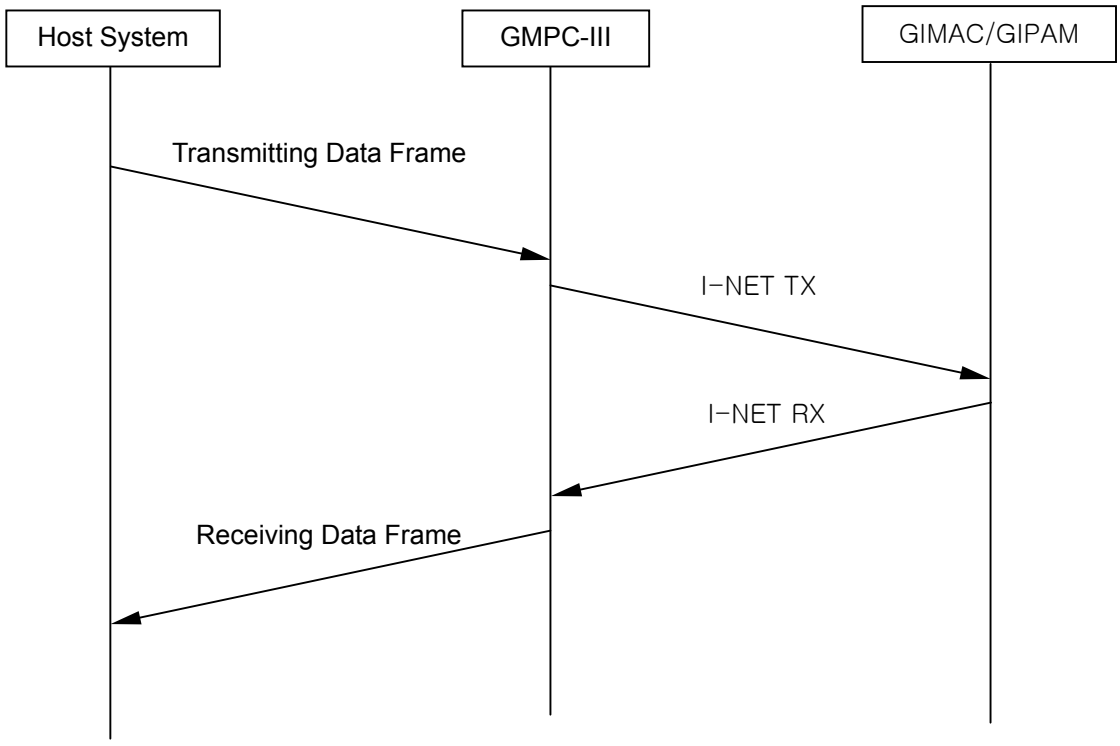
[P1] + [P2] + [DEST] + [E:FN:LEN] + [DATA-0] + … + [DATA-n] + [ECC]
[ ] ; 1 BYTE

NAME	SIZE	VALUE	DESCRIPTION
P1	1 BYTE	0xFF	1st PREAMBLE
P2	1 BYTE	0x00	2nd PREAMBLE
DEST	1 BYTE	0x00 – 0xFF	I-NET ADDRESS for a receiving apparatus
E	1 BIT	0	Normal Response
		1	Abnormal Response
FN	2 BIT	00	Transmitting Junction
		01	Time Setting
		10	Setting Value of GMPC
		11	Reserve
LEN	5 BIT	0 – 16	Length of data willing to transmit [Byte]
DATA	n BYTE	0x00 – 0xFF	Details of BINARY DATA
ECC	1 BYTE	0x00 – 0xFF	Error Check Code(CHECK-SUM) -The residual(The sum of data from [DEST] to [DATA] / 256)

9.3 Transmitting Junction PROTOCOL

[P1] + [P2] + [DEST] + [0:00:LEN] + [DATA-0] + … + [DATA-n] + [ECC]

- It is used for transmitting data from the Host system (PC/MODEM) to GIMAC/GIPAM or vise versa. And FN in the data frame for transmission is 00 at this point.
- E bit in the data frame for transmitting or receiving is always 0.
-The data frame that GMPC has received is discarded when there is ECC error on it .
-The data frame that GMPC has received is also discarded when there is an error in value on it.
-The structure of the data frame Ex.) 0xFF + 0x00 + 0x23 + [0:00:1] + 0x10 + 0x34



9.4 Synchronization PROTOCOL

[P1] + [P2] + [DEST] + [E:01:LEN] + [DATA-0] + … + [DATA-n] + [ECC]

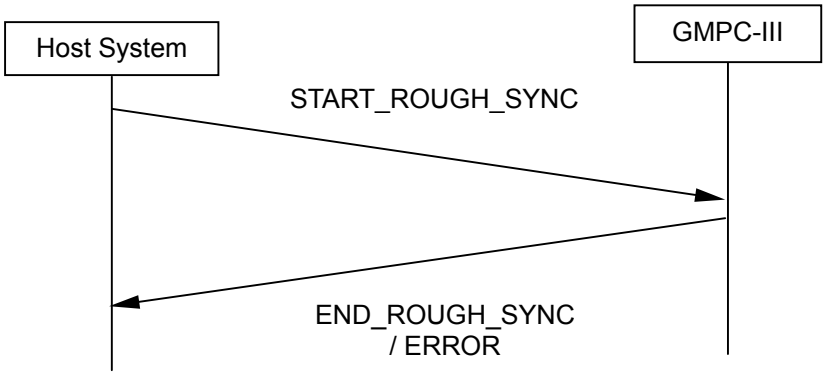
It is used for synchronizing GMPC with the Host system(PC/MODEM). And FN in the data frame for transmission is 01 at this point.
The data in [DEST] is disregarded.

The data frame that GMPC has received is discarded when there is ECC error on it .

The data frame that GMPC has received is recognized as abnormal response (E bit = 1) when there is an error in value on it.

There are two different types of synchronization which are ROUGH SYNC and PRECISION SYNC.

9.4.1 ROUGH SYNC



- START_ROUGH_SYNC

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0x27 + 0x00 + year + mon + day + hour + min + sec + ECC	
[DATA-0]	0x00	START_ROUGH_SYNC
[DATA-1]	year	Inputting the last two digits of year as binary
[DATA-2]	mon	Inputting the value of month as binary
[DATA-3]	day	Inputting the value of date as binary
[DATA-4]	hour	Inputting the value of hour as binary
[DATA-5]	min	Inputting the value of minute as binary
[DATA-6]	sec	Inputting the value of second as binary

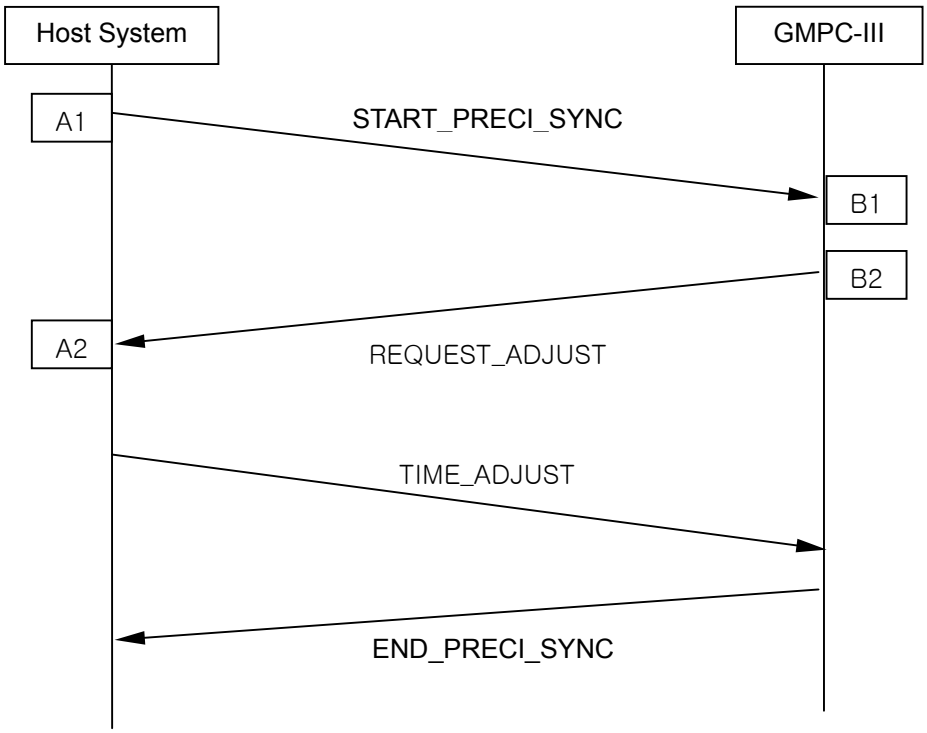
- END_ROUGH_SYNC

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0x21 + 0x00 + ECC	
[DATA-0]	0x00	END_ROUGH_SYNC

- ERROR

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0XA0 + ECC

9.4.2 PRECISION SYNC



The Host system transmits START_PRECI_SYNC frame to GMPC. And The Host system stores the time when the first frame and the first bit is started transmitting (A1) at this point.

GMPC stores the point that the first frame and the first bit of START_PRECI_SYNC frame is received (B1).

GMPC transmits REQUEST_ADJUST frame to the Host system. And GMPC stores the time when the first frame and the first bit is started transmitting (B2) at this point.

The Host system stores the point that the first frame and the first bit of REQUEST_ADJUST frame is received (A2)

The Host system transmits TIME_ADJUST frame to GMPC. And this frame includes the starting point that TIME_ADJUST frame is transmitted and the time data (A1,A2) which has already been stored.

RTC (Real Time Clock), inside of GMPC, is calibrated by using the time data A1,A2 which have been received and B1,B2 stored in GMPC.

ADJ = ((A2 − A1) − (B2 − B1)) / 2

T_NEW = T_OLD + ADJ

If there is an error on the data that GMPC received, GMPC requests restarting SYNC SEQUENCE via transmitting REQUEST_RESTART_SYNC frame to the Host system.
Since the Host system receives REQUEST_RESTART_SYNC frame from GMPC, it restarts SYNC SEQUENCE as requested.
If there is an error on the data that the Host system received, the Host system restarts SYNC SEQUENCE via transmitting SYNC_PRECI_SYNC frame to GMPC.

START_PRECI_SYNC

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0x21 + 0x01 + ECC	
[DATA-0]	0x01	START_PRECI_SYNC

REQUEST_ADJUST

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0x21 + 0x01 + ECC	
[DATA-0]	0x01	REQUEST_ADJUST

TIME_ADJUST

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0x2C + 0x02 + year + mon + day + A2(4) + A1(4) + ECC	
[DATA-0]	0x02	Time_Adjust
[DATA-1]	year	Inputting the last two digits of year as binary
[DATA-2]	mon	Inputting the value of month as binary
[DATA-3]	day	Inputting the value of date as binary
[DATA-4 - 7]	A2	Inputting the value of millisecond(Long Word, 4-Byte)
[DATA-8 - 11]	A1	Inputting the value of millisecond(Long Word, 4-Byte)

END_PRECI_SYNC

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0x21 + 0x02 + ECC	
[DATA-0]	0x02	END_PRECI_SYNC

9.5 Internal Setting PROTOCOL

[P1] + [P2] + [DEST] + [E:10:LEN] + [DATA-0] + … + [DATA-n] + [ECC]

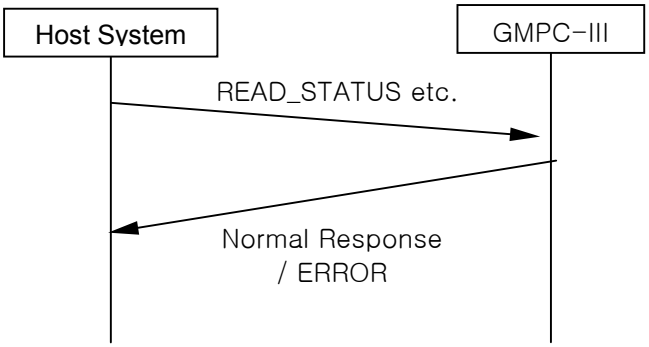
It is used for monitoring status of GMPC or changing the setting information. And FN in the data frame for transmission is 10 at this point.

The data in [DEST] is disregarded.

The data frame that GMPC has received is discarded when there is ECC error on it .

The data frame that GMPC has received is recognized as abnormal response (E bit = 1) when there is an error in value on it.

The internal setting PROTOCOL is as follow.



9.5.1 READ_STATUS

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0X41 + 0x01 + ECC	
[DATA-0]	0x01	READ_STATUS

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0X4E + 0x01 + year + mon + day + hour + min + sec + err + t/m + sync_en + is_sync + inet_addr + rs232/485 + baud_num + ECC

[DATA-0]	0x01	Read_Status
[DATA-1]	year	The value of year that GMPC displays at present
[DATA-2]	mon	The value of month that GMPC displays at present
[DATA-3]	day	The value of day that GMPC displays at present
[DATA-4]	hour	The value of hour that GMPC displays at present
[DATA-5]	min	The value of minute that GMPC displays at present
[DATA-6]	sec	The value of second that GMPC displays at present
[DATA-7]	err	Error check on GMPC (0 ; No Error, 1 ; Error)
[DATA-8]	t/m	0 ; Non Time Master, 1; Time Master
[DATA-9]	sync_en	0 ; GIMAC Sync Disable, 1 ; Enable
[DATA-10]	is_sync	0 ; Sync Disable between GMPCs, 1 ; Enable
[DATA-11]	inet_addr	I-NET Address for GMPC
[DATA-12]	rs232/485	0 ; RS-485, 1 ; RS-232
[DATA-13]	baud_num	Transmission speed
		0 ; 2400 bps
		1 ; 4800 bps
		2 ; 9600 bps
		3 ; 14400 bps
		4 ; 19200 bps
		5 ; 28800 bps
		6 ; 33600 bps
		7 ; 38400 bps
		8 ; 56000 bps
		9 ; 57600 bps

9.5.2 WRITE_TIME_MASTER

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0X42 + 0x02 + ON/OFF + ECC	
[DATA-0]	0x02	Write_Time_Master
[DATA-1]	0x00	Off
	0x01	On

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0X42 + 0x02 + ON/OFF + ECC	
[DATA-0]	0x02	WRITE_TIME_MASTER
[DATA-0]	0x00	OFF
	0X01	ON

9.5.3 WRITE_SYNC_ENABLE

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0X42 + 0x03 + ON/OFF + ECC	
[DATA-0]	0X03	WRITE_SYNC_ENABLE
[DATA-1]	0X00	OFF
	0X01	ON

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0X42 + 0x03 + ON/OFF + ECC	
[DATA-0]	0x03	WRITE_SYNC_ENABLE
[DATA-1]	0x00	OFF
	0x01	ON

9.5.4 WRITE_INET_ADDRESS

PC → GMPC-III	0xFF + 0x00 + 0x?? + 0X42 + 0x04 + inet_address + ECC	
[DATA-0]	0x03	WRITE_INET_ADDRESS
[DATA-1]	inet_addr	I-NET Address for GMPC

PC ← GMPC-III	0xFF + 0x00 + 0x?? + 0X42 + 0x04 + inet_address + ECC	
[DATA-0]	0x03	WRITE_INET_ADDRESS
[DATA-1]	inet_addr	I-NET Address for GMPC

10 GIMAC-II Protocol

10.1 Data Request (PC → GIMAC II)

COMMAND	Description	Details
10h	Requesting Status data	Status of Input/Output points
11h	Requesting Phase Current data	IR,IS,IT
12h	Requesting Line Voltage data	VRS,VST,VTR
13h	Requesting PF, W, Var data	PF,W,VAR
14h	Requesting F, Wh, Varh data	FREQ,WH,VARH
15h	Requesting Phase Voltage data (3P4W)	VRN,VSN,VTN

10.2 Data Transmission (GIMAC II → PC)

10.2.1 STATUS Data

BYTE	1	2	3	4	5	6	7
RECEIVE " Ex."	00h	81h	FFh	FFh	17h	0Fh	checksum

a) 1st. byte : 00h ⇒ requested COMMAND CODE (requesting STATUS Data)

b) 2nd. byte : 81h ⇒ DEVICE ID (signifying GIMAC- II with SBO function)

c) 3rd. byte : FF ⇒ Status of fault input at present (Latch Signal)

(MSB) 1 1 1 1 1 1 1 1 (LSB)
BIT7 : Heavy Fault Output
BIT6 : Light Fault Output
BIT5 : Heavy Fault input for OVGR
BIT4 : Heavy Fault input for OCGR
BIT3 : Heavy Fault input for OVR
BIT2 : Heavy Fault input for UVR
BIT1 : Heavy Fault input for SGR
BIT0 : Heavy Fault input for OCR

d) 4th byte : FF ⇒ Status of fault input at present

(MSB) 1 1 1 1 1 1 1 1 (LSB)
BIT7 : Heavy Fault Output
BIT6 : Light Fault Output
BIT5 : Heavy Fault input for OVGR
BIT4 : Heavy Fault input for OCGR
BIT3 : Heavy Fault input for OVR
BIT2 : Heavy Fault input for UVR
BIT1 : Heavy Fault input for SGR
BIT0 : Heavy Fault input for OCR

e) 5th.byte : 17 ⇒ Status of CB

(MSB) 0 0 0 1 0 1 1 1 (LSB)
BIT7,6,5 : Null
BIT 4 : CB ON Output
BIT 3 : CB OFF Output
BIT 2 : 0 = LOCAL , 1= REMOTE
BIT 1 : CB ON Input
BIT 0 : CB OFF Input

f) 6th. byte : 0F ⇒ Status of RESET

(MSB) 0 0 0 0 1 1 1 1 (LSB)
BIT7~4 : Null
BIT3 : REMOTE FAULT RESET
BIT2 : LOCAL FAULT RESET
BIT1 : REMOTE WH RESET
BIT0 : LOCAL WH RESET

g) 7th. byte : (1st BYTE + …. + 6th BYTE) % 0x100

Note) Status of bit ⇒ 0 : SET

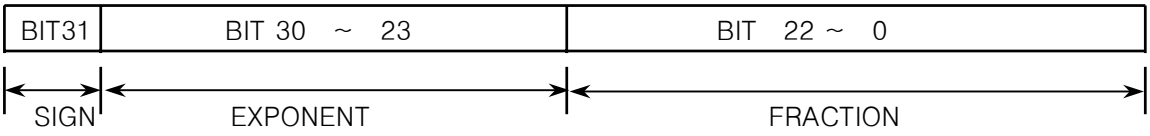
10.2.2 Measuring Data

Command CODE	2,3,4,5(byte)	6,7,8,9(byte)	10,11,12,13(byte)	14	Remarks
01H	R Phase Current(Ir)	S Phase Current(Is)	T Phase Current (It)	Check Sum	
02H	Line Voltage between R and S Phase (Vrs)	Line Voltage between S and T Phase (Vst)	Line Voltage between T and R Phase (Vtr)		
03H	Power	Watt	Volt-Ampere Reactive		
04H	Frequency	Wh	Varh		
05H	R Phase Voltage(Vrn)	S Phase Voltage(Vsn)	T Phase Voltage(Vtn)		3P4W

* Checksum = (1st BYTE + … + 13th BYTE) % 0x100

Note) This data is transmitted from LSB to MSB one after another

Representation of FLOATING POINT



- The representation follows IEEE 754.
- It is available to read by High Level Programming Language such as C or FORTRAN, if 4 bytes of data is stored into FLOATING POINT Variable.

Ex.) < C-Program >

```
char    RxBuffer[16];
float   IR,IS, IT;
int      I;

for(I=0;I<4;I++){
    ((char *)(&IR))[I] = RxBuffer[I+1];
    ((char *)(&IS))[I] = RxBuffer[I+5];
    ((char *)(&IT))[I] = RxBuffer[I+9];
}
```

10.3 Control Command I

COMMAND(1BYTE) +SUBCOMMAND(1BYTE)+CHECKSUM(1BYTE)
* COMMAND : 0x20
** SUBCOMMAND : See the table below.
*** CHECKSUM = (COMMAND+ SUBCOMMAND) % 0x100

SUB COMMAND	Description
42h	WH/VARH RESET
43h	FAULT RESET
44h	RESET the Number of times of CB operation
45h	RESET accumulated time when CB is on

10.4 Control Command II

10.4.1 Command of selecting control point

COMMMAND(1BYTE) +
SUBCOMMAND(1BYTE)+
Control CODE1(1 BYTE) + Control CODE2(1 BYTE) + CHECK SUM(1BYTE)
* COMMAND : 0x2e
** SUBCOMMAND : 0xaa
*** Control CODE1, Control CODE2 : See the table below
****CHECKSUM=(COMMAND + SUBCOMMAND + Control CODE1 + Control CODE 2) % 0x100

Control CODE1	Control CODE2	Description
60h	96h	Selecting CB ON
61h	69h	Selecting CB OFF
00h	FFh	Cancel Selecting CB Control

10.4.2 Command of operating Control point

COMMMAND(1BYTE) +
SUBCOMMAND(1BYTE)+
Control CODE1(1 BYTE) + Control CODE2(1 BYTE) + CHECK SUM(1BYTE)
* COMMAND : 0x2d
** SUBCOMMAND : 0x55
*** Control CODE1, Control CODE2 : See the table below
****CHECKSUM=(COMMAND + SUBCOMMAND + Control CODE1 + Control CODE2) % 0x100

Control CODE1	Control CODE2	Description
9fh	69h	Operating CB ON
9eh	96h	Operating CB OFF

10.5 ACK/NAK Response for Control Command I / II

10.5.1 ACK

It responds when the Control Command I / II is operated successfully.

A0h
Command Field of Control Command operated
SubCommand Field of Control Command operated
Checksum

*Checksum : (0xa0 + Command Field + SubCommand Field) % 0x100

10.5.2 NAK

A1h
Error Code
Checksum

* Error Code
01 : Abnormal Command
02 : Not being operated at present
03 : Abnormal Control Command
04 : CB Control in Remote Bypassing in LOCAL MODE

** Checksum : (0xa1 + Command Field + Error Code) % 0x100

11 GIPAM Protocol

11.1 Data communication of GIPAM, SOE GIPAM

Device ID is GIPAM (GIPAM-115N : 82), SOE GIPAM (GIPAM-115S : 83)

GIPAM-115N does not respond to requesting data which is related to SOE function or responds " NAK Message".

11.1.1 Status Data of GIPAM, SOE GIPAM

- Requesting status information

Command	10h
Sub Command	-

- Status Data

Command	00h							
Device ID	82h or 83h							
Operating Status of Relays	Ir>	Is>	It>	In>	Ir>>	Is>>	It>>	In>>
	OVR	UVR	VG>	SGR	VG>>	1	1	Sys.
CB Status	-	-	-	ON out	OFF out	Local*	On in	OFF in
Status of Reset/Clear	SOE	R'y Set	L-Rst	R-Rst	Local*	Clear Command Code**		
Error Code in GIPAM								
Data Check Sum	Check Sum							

* '1' : Remote, '0' : Local

** Clear Command Code

*** Checksum(1Byte) = ((Command 1Byte + Device ID 1Byte + Data 6Byte) / 256) ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW

Clear Command Code

0000	Wh Clear
0001	Varh Clear
0010	SOE Buffer Clear
0011	CB ON Counter Clear
0100	CB ON Time Clear
0101	V0 Max. Clear
0110	All Clear
0111	Clear Nothing
1xxx	

- 1 : off, 0 : on ⇒ All Status bit
- 1 : on, 0 : off ⇒ ON out, OFF out Status
- Ir> : Time Delay Characteristic of OCR (R Phase)
- Ir>> : Instantaneous Characteristic of OCR (R Phase)
- V_G> : Time Delay Characteristic of OVGR
- V_G>> : Instantaneous Characteristic of OVGR.
- Sys. : Internal Error of GIPAM
- SOE = 1(ON) : Data exists in SOE Buffer at present.

11.1.2 CURRENT

- Requesting Current Information

Command	11h
Sub Command	-

- Current Data

Command	01h
R Phase Current	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
S Phase Current	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
T Phase Current	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Data Check Sum	Check Sum

- The representation follows IEEE Standards (4 Byte Floating Point Number)
- Checksum(1Byte) = (Command 1Byte + Data 12Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW

11.1.3 Line Voltage

- Requesting Line Voltage Information

Command	12h
Sub Command	-

- Line Voltage Data

Command	02h
Voltage between R and S phase (1P3W : Between R and N Phase)	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Voltage between S and T phase (1P3W : Between S and N Phase)	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Voltage between T and R phase (1P3W : Between T and N Phase)	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Data Check Sum	Check Sum

- The representation follows IEEE Standards (4 Byte Floating Point Number)
- 1P2W : 2nd data(S-T)& 3rd data(T-R) become null
- Checksum(1Byte) = (Command 1Byte + Data 12Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.1.4 Power

- Requesting Power Information

Command	13h
Sub Command	-

- Power Data

Command	03h
Power Factor	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Watt	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)

Volt-Ampere Reactive	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Data Check Sum	Check Sum

- The representation follows IEEE Standards (4 Byte Floating Point Number)
- (Reactive Power) = SQRT{(Apparent Power)^2 - (Active power)^2}
- Checksum(1Byte) = (Command 1Byte + Data 12Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.1.5 Frequency / Watt Hour

- Representing Frequency & Watt hour Information.

Command	14h
Sub Command	-

- Frequency & Watt hour Data

Command	04h
Frequency	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Active Power	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Reactive Power	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Data Check Sum	Check Sum

- The representation follows IEEE Standards (4 Byte Floating Point Number)
- Checksum(1Byte) = (Command 1Byte + Data 12Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.1.6 Phase Voltage

- Requesting Phase Voltage Information

Command	15h
Sub Command	-

- Phase Voltage Data

Command	05h
R Phase Voltage (R-N)	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
S Phase Voltage (S-N)	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
T Phase Voltage (T-N)	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Data Check Sum	Check Sum

- The representation follows IEEE Standards (4 Byte Floating Point Number)
- This is available only if " 3P4W" is set
- Checksum(1Byte) = (Command 1Byte + Data 12Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.1.7 Zero Phase Voltage

- Requesting Zero Phase Voltage Information

Command	16h
Sub Command	-

- Zero Phase Voltage Data

Command	06h
V0	MSB (Byte 3)
	Byte 2
	Byte 1

	LSB (Byte 0)
Vo max.	MSB (Byte 3)
	Byte 2
	Byte 1
	LSB (Byte 0)
Data Check Sum	Check Sum

- This is supported only if OVGR enables.
- The representation follows IEEE Standards (4 Byte Floating Point Number)
- Checksum(1Byte) = (Command 1Byte + Data 8Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.1.8 SOE Data

GIPAM-115N does not respond to requesting data which is related to SOE function or responds " NAK Message".

- Requesting SOE Data

Command	19h							
Sub Command	0	0	0	0	0	0	Clear	Req.

- Req. Bit : Requesting Data Frame 1
- Clear Bit : Canceling one frame of the data in Buffer

a) Requesting the data in Buffer

Command	19h
SubCommand	01h

b) Canceling one frame of the data in Buffer

Command	19h
SubCommand	02h

c) Requesting the next data after canceling the present data in buffer

Command	19h
Sub Command	03h

- SOE Data

Command	09h
Sub Command	00 : SOE Buffer Empty 01 : Information of occurring Fault 02 : Information of setting Relays 03 : Information of CB status / Clearing Data

Device ID	83h
Fault occurred Time	4 Byte msec Time
Status Information	1 ~ 4 Byte
Data Check Sum	Check Sum

- Checksum = (Command 1Byte + Sub Command 1Byte + Device ID 1byte + Fault occurred t time 4Byte + Data 1~4Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

- SOE Event is classified and presented on the last 7 bits of Sub Command

- The MSB (Bit 7) of Sub Command is EOD which stands for End Of Data

EOD=0 : The present frame is the last SOE data

EOD=1 : Other SOE data exists in the buffer

- Fault occurred time : It is the value of 4 Byte Long Integer and represents time that present status has been changed as 32bit Binary Number (0hou. 0min. 0.000sec.)

- The MSB (Bit 31) of Fault occurred time is Time-Valid Flag (1:Null)

- 1 : off, 0 : on ⇒ All Status bit

a) SOE Buffer Empty – No SOE Data exists

Command	09h
SubCommand	00h

b) Information of Fault

Command	09h							
SubCommand	EOD	01h						
Device ID	83h							
Fault occurred Time	T-Valid	T30	T29	T28	T27	T26	T25	T24
	T23	T22	T21	T20	T19	T18	T17	T16
	T15	T14	T13	T12	T11	T10	T9	T8
	T7	T6	T5	T4	T3	T2	T1	T0
Status of Relays	Ir>	Is>	It>	In>	Ir>>	Is>>	It>>	In>>
	OVR	UVR	VG>	SGR	VG>>	1	1	Sys.
Null	-							
	-							
Data Check Sum	Check Sum							

- Checksum(1Byte) = (Command(1Byte) + SubCommand(1Byte) + Device ID(1byte) +Fault occurred time(4Byte) + status of Relay (2Byte) + Null(2Byte)) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

c) Information of setting Relays

Command	09h							
Sub Command	EOD	02h						
Device ID	83h							
Fault occurred Time	T-Valid	T30	T29	T28	T27	T26	T25	T24
	T23	T22	T21	T20	T19	T18	T17	T16
	T15	T14	T13	T12	T11	T10	T9	T8
	T7	T6	T5	T4	T3	T2	T1	T0
Relay Setting	1	1	1	1	Remote	Local	Remote Fault Reset	Local Fault Reset
Data Check Sum	Check Sum							

- Checksum(1 Byte) = (Command(1Byte) + Sub Command(1Byte) + Device ID(1Byte) + Fault occurred time(4Byte) + Relay Setting(1Byte) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

d) Information of CB status & Data clear

Command	09h							
Sub Command	EOD	03h						
Device ID	83h							
Fault occurred Time	T-Valid	T30	T29	T28	T27	T26	T25	T24
	T23	T22	T21	T20	T19	T18	T17	T16
	T15	T14	T13	T12	T11	T10	T9	T8
	T7	T6	T5	T4	T3	T2	T1	T0
CB Status	Local ON	Local OFF	Remote ON	Remote OFF	1	1	ON	OFF
Changing of CB status	Local ON	Local OFF	Remote ON	Remote OFF	0	0	ON	OFF
Local Clear	Power ON Rst	1	V0 Max	CB ON Time	CB ON Counter	SOE Buffer	varh	Wh
Remote Clear	1	1	V0 Max	CB ON Time	CB ON Counter	SOE Buffer	varh	Wh
Data Check Sum	Check Sum							

- Output of CB status(Local ON/OFF, Remote ON/OFF) is recorded only the moment that CB is closed but Input of CB status is recorded in both moment closed and open.
- It represents that CB status has been changed when each bit is ‘ 1’
- Checksum(1Byte) = (Command(1Byte) + Sub Command(1Byte) + Device ID(1byte) +

Fault occurred time(4Byte) + Data(4Byte)) / 256 ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

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11.1.9 GIPAM Setting Data

- Requesting the set Data

Command	1D
Sub Command	00h : Measuring Part Setting 01h : OCR/OCGR Setting 02h : OVR/UVR Setting 03h : OVGR/SGR Setting 04h : SOE Data Setting

a) Requesting the Set Data of Measuring Part

Command	1Dh
Sub Command	00h

b) Requesting the Set Data for OCR / OCGR

Command	1Dh
Sub Command	01h

c) Requesting the Set Data for OVR / UVR

Command	1Dh
Sub Command	02h

d) Requesting the Set Data for OVGR / SGR

Command	1Dh
Sub Command	03h

e) Requesting information of enabling SOE and status of Timer

Command	1Dh
Sub Command	04h

- Setting Data

Command	0Dh
Sub Command	00h : Measuring Part Setting 01h : OCR/OCGR Setting 02h : OVR/UVR Setting 03h : OVGR/SGR Setting 04h : SOE Data Setting
Setting Data	~ 11 Byte
Data Check Sum	Check Sum

a) Set Data of Measuring Part

Command	0Dh
Sub Command	00h
Setting CT Ratio	Refer to setting DIP Switch in the GIPAM Manual
Setting PT Ratio	Refer to setting DIP Switch in the GIPAM Manual
Setting System wiring	
Setting Relay enables	
Number of CB operation	
Accumulated time that CB is closed (100msec)	
Data Check Sum	Check Sum

- Checksum(1Byte) = (Command(1Byte) + Sub Command (1Byte) + Data(10Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

b) OCR/OCGR Setting Data

Command	0Dh
Sub Command	01h
Current value of Time Delay char. for OCR	X.X
Current value of Instantaneous char. for OCR	XX
Time/Char. Curve for OCR	0X
Operating time for OCR	0X (Up to a decimal point)
	.XX (Down to a decimal point)
Current value of Time Delay char. for OCGR	.XX
Current value of Instantaneous char. for OCGR	X.X
Time/Char. Curve for OCR	0X
Operating time for OCR	0X (Up to a decimal point)
	.XX (Down to a decimal point)
Selecting OCGR Function	0X
Data Check Sum	Check Sum

- Each item is represented as BCD that has a decimal point.

- Checksum(1Byte) = (Command(1Byte) + Sub Command(1Byte) + Data(11Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW

- Time Characteristic Curve for OCR/OCGR

Data	T/C Curve
00	Definite 2sec
01	Definite 4sec
02	Definite 8sec
03	Standard Inverse
04	Very Inverse
05	Extremely Inverse
06	Long Inverse

- Selecting the Relay operation(OCGR)

Data	Selecting the Relay Operation
00	Disable
01	Alarm Only
02	Alarm & Trip

c) OVR/UVR Setting Data

Command	0Dh
SubCommand	02h
Operating Voltage for OVR	0X (Up to a decimal point)
	.XX (Down to a decimal point)
Operating Time for OVR	XX (Up to a decimal point)
	.X0 (Down to a decimal point)
Selecting OVR Function	0X
Operating Voltage for UVR	.XX
Operating Time for UVR	XX (Down to a decimal point)
	.X0 (Up to a decimal point)
Selecting UVR Function	0X
Data Check Sum	Check Sum

- Each item is represented as BCD that has a decimal point.

- Checksum(1Byte) = (Command(1Byte) + Sub Command(1Byte) + Data(11Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

- Selecting the Relay operation(OVR/UVR)

Data	Selecting the Relay Operation
00	Disable
01	Alarm Only
02	Alarm & Trip

d) OVGR/SGR Setting Data

Command	0Dh
Sub Command	03h
Voltage value of Time Delay char. for OVGR	.XX
Voltage value of Instantaneous char. for OVGR	.XX
Operating Time for OVGR	0X (Up to a decimal point)
	.XX (Down to a decimal point)
Selecting OVGR Function	0X
Operating Current for SGR	X.X
Operating Voltage for SGR	X.X
Operating Time for SGR	XX (Up to a decimal point)
	.X0 (Down to a decimal point)
Selecting SGR Function	0X
Reserved (Setting External Trip Operation)	0X
Data Check Sum	Check Sum

- Each item is represented as BCD that has a decimal point.

- Checksum(1Byte) = (Command(1Byte) + Sub Command(1Byte) + Data(11Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW

- Selecting the Relay operation (OVGR/SGR)

Data	Selecting the Relay operation
00	Disable
01	Alarm Only
02	Alarm & Trip

e)Information of enabling SOE and status of Timer

Command	0Dh							
SubCommand	04h							
Enabling Event of Relay operation	Ir>	Is>	It>	In>	Ir>>	Is>>	It>>	In>>
	OVR	UVR	VG>	SGR	VG>>	- (Ext.)	0	Sys.
Enabling Event of CB Status	Local ON	Local OFF	Remote ON	Remote OFF	0	0	ON	OFF
Enabling Event of Reset/Clear	Relay Setting	Fault Reset	V0 Max	CB ON Time	CB ON Counter	SOE Buffer	Varh	Wh
Calibrating the timer in GIPAM								
Time error of former synchronous code When received								
A cycle of former synchronous code When received								
Data Check Sum	Check Sum							

- Checksum(1Byte) = (Command(1Byte) + Sub Command(1Byte) + Data(11Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW

- Event Enable
  - ✧ It decides to make SOE Data about the event occurred.
  - ✧ SOE data is made when there is an event occurring which is set '1.'
- Value for calibrating the timer inside GIPAM
  - ✧ It is calibrating value to synchronize the timer with System Time.
  - ✧ It indicates a number of clocks (0.4 ㎲)as a 2Byte-Signed Integer.
- Time error of former synchronous code when received.
  - ✧ It indicates time gap between the time in the synchronous code and the one that stored timer inside GIPAM when the last synchronous code is received and it is also described as a 2Byte-signed integer.
- A cycle of former synchronous code when received.
  - ✧It indicates time gap between the last synchronous code and the previous to the last one as a 2Byte-unsgned Integer .
  - ✧If this value is 'FFFF', it means synchronization fail because the synchronizing cycle exceeds the tolerance limit.

11.1.10 Device ID

Requiring Device ID

Command	1Eh
Sub Command	-

Device ID Data

Command	0Eh
Device ID	82h or 83h
Device Name / Version	ASCII String within12Byte
Data Check Sum	Check Sum

- Checksum(1Byte) = (Command 1Byte + Device ID 1Byte + Data 12Byte) / 256
  ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW

11.2 Control Command

11.2.1 Control Command

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Command	0	0	1	0	Reply	Command ID		
Sub Command	1 Byte							
Data	0 ~ 9 Bytes							
Data Check Sum	Check Sum							

- Checksum(1Byte) = (Command 1Byte + Sub Command 1Byte + Data 0~9Byte) / 256
  ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

ㄱ) Reply (Bit 3)
✧It shows whether ACK response is requested by Control Command.
✧'1' : Requesting ACK response. '0' :Not necessary.

ㄴ) Command ID (Bit 2 ~ Bit 0)
✧ It shows a type of Control Command.

- 000 : Controlling a Point
  ✧It is a Command to control each point such as Controlling CB OPEN/CLOSE, Wh Reset etc.
  ✧Sub Command designates a point which wills to be controlled.
- 011 : Setting SOE Event
  ✧The event is set as SOE Event.
  ✧Sub Command has to be '0x00'.
- 100 : Setting the Remote
  ✧The protection relay part of GIPAM is set on the remote.
  ✧Sub Command designates a relay which wills to be set.

ACK/NAK Response

a) ACK

✧ It replies when the control command of which Reply Bit is set executed completely.

Command	A0h
Sub Command	Field of the control command executed
Sub Command 2	Field of the control command executed
Data Check Sum	Check Sum

b) NAK

Command	A1h
Error Code	01 ~ 04
Data Check Sum	Check Sum

✧ Error Code
01 : Wrong control command, 02 : Not being able to execute
03 : Lack of Data, 04: DATA range is incorrect

11.2.2 Command for controlling a point

	Not requiring ACK Signal	Requiring ACK Signal
Command	20h	28h
Sub Command	Control Point	
Data Check Sum	Check Sum	

- Checksum(1Byte) = (Command 1Byte + Sub Command 1Byte + Data 0~9Byte) / 256
  ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

✧ Control Point
02 : Relay Fault Reset
03 : Clear Wh
04 : Clear varh
05 : Clear All SOE Data
06 : Clear CB ON Counter
07 : Clear CB ON Time
08 : Clear V0 Max.
09 : Clear All Backup Data

11.2.3 Command for setting SOE event.

	Not requiring ACK Signal	Requiring ACK Signal
Command	23h	2Bh
SubCommand	00h	
Data	Fault #1	
	Fault #2	
	CB	
	Reset	

✧ Setting Data

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault #1	Ir> (1)	Is> (1)	It> (1)	In> (1)	Ir>> (1)	Is>> (1)	It>> (1)	In>> (1)
Fault #2	OVR (1)	UVR (1)	VG> (1)	SGR (1)	VG>> (1)	(1)	0	Sys. (1)
CB	Local ON (0)	Local OFF (0)	Remote ON (0)	Remote OFF (0)	0	0	ON (1)	OFF (0)
Setting / Reset	Relay Setting (0)	Fault Reset (0)	V0 Max (0)	CB ON Time (0)	CB ON Counter (0)	SOE Buffer (0)	Varh (0)	Wh (0)

* '1'; Enable, '0'; Disable.
* The value between the brackets is a default.

11.3 Command for controlling CB on/off

To control CB on/off on remote, it transmits the command for selecting control point and for operating control point sequentially.

11.3.1 SBO (Select Before Operate)

- ✧ It applies to command for CB Open/Close.
- ✧ Transmitting the command for selecting control point to GIPAM.
  - ➢ GIPAM replies with ACK Signal.
  - ➢ Transmitting the command for operating the point selected before time's up.
  - ➢ GIPAM replies with ACK Signal as well as outputs the control signal.

11.3.2 Reacting to other command after receiving the command for selecting control point.

- ✧ Disregarding a command to control other CB.
- ✧ Canceling the selected point to control CB in the event of receiving the command to control other one.
- ✧ Canceling the selected point if there is something wrong with the command.
- ✧ Responding to a command that requests Measurement data normally.

11.3.3 Control Command

11.3.3.1 Command selecting control.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Command	2Eh							
Sub Command	AAh							
Data	selecting Data 1							
	selecting Data 2							
Data Check Sum	Check Sum							

✧ Selecting Data

Selecting Data 1 Selecting Data 2

60h 96h - Selecting CB Close.

61h 69h - Selecting CB Open.

00h FFh - Canceling the selected point to Control CB.

- Checksum(1Byte) = (Command 1Byte + Sub Command 1Byte + Data 0~9Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.3.3.2 Control Command

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Command	2Dh							
Sub Command	55h							
Control Point	Control Point 1							
	Control Point 2							
Data Check Sum	Check Sum							

✧Control Data (Reversing all data of command which is selected to control CB)

✧Control Point

Control Point 1 Control Point 2

9Fh 69h - CB Close

9Eh 96h - CB Open

- Checksum(1Byte) = (Command 1Byte + Sub Command 1Byte + Data 0~9Byte) / 256

⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW.

11.3.4 Setting Time-out of SBO (Added to the Command for setting SOE Event)

11.3.4.1 Setting Time-out data.

	Not requiring ACK Signal	Requiring ACK Signal
Command	23h	2Bh
SubCommand	11h	
Data	Time-out (High Byte)	
	Time-out (Low Byte)	

✧ Time-out data is displayed in 10ms and the length is 16 bits.

✧ Default value of Time-out is 5 seconds.

✧ It has to be set over than 1 second.

11.3.4.2 Reading Time-out data (Added to the Data for setting GIPAM)

Requiring Timeout Data

Command	1Dh
SubCommand	05h

Timeout Data

Command	0Dh
SubCommand	05h
SBO Timeout	
Data Check Sum	Check Sum

- Checksum(1Byte) = (Command 1Byte + Sub Command 1Byte + Data 0~9Byte) / 256
  ⇒ The residual

※ Checksum is the sum of each bytes not to include OVERFLOW..

12 Modbus

12.1 Setting of MODBUS TOPIC

All of the following examples are applied to WONDERWARE MODICON MODBUS I/O SERVER

- MAX COIL READ COUNT : 8
- MAX COIL WRITE COUNT : 8
- MAX REGISTER READ COUNT : 8
- MAX REGISTAER WRITECOUNT : 8

12.2 ITEM/POINT NAME

12.2.1 SIGNED REGISTER

It has a value of decimal 0 ~ 65535 range when WONDERWARE MODICON MODBUS I/O SERVER is used. It has a name of "REGISTER_NAME"+ " "+ "S" when its data type is signed integer.

Example) 3001 :UNSIGNED REGISTER (0 ~ 65535)

Example) 3001 S :SIGNED REGISTER (-32,768 ~ 32767)

12.2.2 LONG INTEGER

It consists of two registers and is type of 32BIT-SIGNED INTEGER. Its name is "REGISTER_NAME" + " " + "L

Example)30001 L :30001 and 30002 are used

12.2.3 FLOATING POINT

It consists of two registers and is type of IEEE 32 Bit Floating Point Number. Its name is "REGISTER_NAME" + " " + "F

Example) 30001 F :30001and 30002are used.

12.2.4 BIT IN REGISTER

Following Examples are applied

Example)30001:1 : MSB(MOST SIGNIFICANT BIT) of INPUT REGISTER

Example)30008:16 : LSB(LEAST SIGNIFICANT BIT) of INPUT REGISTER

* Two of the most significant bytes and the list significant bytes in float-pointing data

are swapped and transmitted on GMPC III MODBUS communication.

For example when GMPC III receives the data which is a type of Floating point as below from other devices such as GIMAC II, GIPAM, and so forth.

" 01h 02h 03h 04h "

It transmits the data changed as follow to the master station.

" 03h 04h 01h 02h "

12.3 USABLE ADDRESS RANGE in each Device

Device NAME	COIL	CONTACT	INPUT REGISTER	HOLDIG REGISTER
GIMAC-II	41 ~ 101	Unused	30001 ~ 30105	40001~43341
u-RTU	Unused	Unused	31001 ~ 31024	41001 ~ 41101
u-RTU II	Unused	Unused	31501 ~ 31545	41501 ~ 41641
GIMAX III	2001 ~ 2141	Unused	32001 ~ 32246	42001 ~ 42025
GIPAM	3041 ~ 3381	Unused	33001 ~ 33321	43001 ~ 43361
DPR	4001 ~ 5000	Unused	34001 ~ 36647	44001 ~ 44106
GMPC III			39900	49900

12.4 Usable MODBUS OPCODE

OP CODE	READ/WRITE	Description
04h	READ	INPUT REGISTER
05h	WRITE	COIL
06h	WRITE	HOLDIG REGISTER(u-RTU)
10h	WRITE	HOLDIG REGISTER

12.5 ADDRESS Setting in each Device

12.5.1 GIMAC-II

OP CODE	Description	DATA TYPE	ADDRESS	Description
	Status Data QUERY			
04h	DEVICE ID	BYTE	30001	* Lower 1 BYTE
04h	Fault Status Data	INT	30002	BIT Operation Example) 30002 :8

OP CODE	Description	DATA TYPE	ADDRESS	Description
0 – Bit7 : Heavy Fault Output (Previous Status) 1 – Bit6 : Light Fault Output(Previous Status) 2 – Bit5 : OVGR Fault Input(Previous Status) 3 – Bit4 : OCGR Fault Input(Previous Status) 4 – Bit3 : OVR Fault Input(Previous Status) 5 – Bit2 : UVR Fault Input(Previous Status) 6 – Bit1 : SGR Fault Input(Previous Status) 7 – Bit0 : OCR Fault Input(Previous Status) 8 – Bit7 : Heavy Fault Output(Current Status) 9 – Bit6 : Light Fault Output(Current Status) 10 – Bit5 : OVGR Fault Input(Current Status) 11 – Bit4 : OCGR Fault Input(Current Status) 12 – Bit3 : OVR Fault Input(Current Status) 13 – Bit2 : UVR Fault Input(Current Status) 14 – Bit1 : SGR Fault Input(Current Status) 15 – Bit0 : OCR Fault Input(Current Status)				
04h	CB,RESET Status Data	INT	30003	BIT Operation Example) 30003:8
0,1,2 – Bit7,6,5 : Reserved 3 – Bit4 : CB ON Output Status 4. – Bit3 : CB OFF Output Status 5 – Bit2 : 0 = LOCAL, 1=REMOTE 6 – Bit1 : CB ON Input Status 7 – Bit0 : CB OFF Input Status 8 – Bit7,6,5,4 : Reserved 9 – Bit3 : REMOTE FAULT RESET 10 – Bit2 : LOCAL FAULT RESET 11 – Bit1 : REMOTE WH RESET 12 – Bit0 : LOCAL WH RESET				
04h	3 Phase Current			
	IR	FLOAT	30021	Example) 30021 F
	IS	FLOAT	30023	Example) 30023 F
	IT	FLOAT	30025	Example) 30025 F
04h	Line-To-Line Voltage			
	VRS	FLOAT	30041	Example) 30041 F
	VST	FLOAT	30043	Example) 30043 F
	VRT	FLOAT	30045	Example) 30045 F
04h	Power Factor, Active Power, Reactive Power			
	PF	FLOAT	30061	Example) 30061 F
	W	FLOAT	30063	Example) 30063 F
	VAR	FLOAT	30065	Example) 30065 F
04h	Frequency, Active Energy, Reactive Energy			
	FREQ	FLOAT	30081	Example) 30081 F
	WH	FLOAT	30083	Example) 30083 F
	VARH	FLOAT	30085	Example) 30085 F
04h	Phase Voltage			

OP CODE	Description	DATA TYPE	ADDRESS	Description
	VRN	FLOAT	30101	Example) 30101 F
	VSN	FLOAT	30103	Example) 30103 F
	VTN	FLOAT	30105	Example) 30105 F
05h	WH/VARH RESET		41	Control Command
05h	FAULT RESET		61	Control Command
05h	CB Operation Count RESET		81	Control Command
05h	CB Run Time RESET		101	Control Command
06h	CB ON/OFF SBO		40001	
06h	CB ON/OFF		40021	
Example) To send CB ON SBO command to GIMAC II with station address number 1 1st Step) Send CB ON Select Command : 01 06 00 00 60 96 21 A4 2nd Step) After receiving ACK response, Send CB ON Operate Command : 01 06 00 14 9F 69 60 10 Example) To send CB OFF SBO command to GIMAC II with station address number 1 1st Step) Send CB OFF Select Command: 01 06 00 00 61 69 60 74 2nd Step) After receiving ACK response, Send CB OFF Operate Command : 01 06 00 14 9E 96 21 C0				
06h	CB SBO CANCEL		40001	SBO Cancel Command
Example) To send SBO cancel command to GIMAC II with station address number 1 after sending SBO select command QUERY) 01 06 00 00 00 FF C9 8A				

12.5.4 GIPAM (When DEVICE ID is Hex82, Hex83)

SOE function is excluded when DEVICE ID is Hex82

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
O4h	Status Data Request			
	DEVICE ID	BYTE	33001	Lower 1 BYTE
	RELAY Operation Status	BYTE	33002	BIT Operation

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
15 - Ir> 14 - Is> 13 - It> 12 - In> 11 - Ir>> 10 - Is>> 9 - It>> 8 - In>>		7 - OVR 6 - UVR 5 - VG> 4 - SGR 3 - VG>> 2 - 1 1 - 1 0 - SYS		
	CB Status	BYTE	33003	BIT Operation (Lower 1 BYTE)
7 - 0 6 - 0 5 - 0 4 - ONout		3 - OFFout 2 - Local 1 - ONin 0 - OFFin		
	RESET/CLEAR Status		33004	BIT Operation (Lower 1 BYTE)
7 - SOE 6 - R' y Set 5 - L-Rst 4 - R-Rst 3 - Local		2,1,0 - Clear Command Code 000 : wh clear 001 : varh clear 010 : SOE buffer clear 011 : CB ON counter clear 100 : CB ON time clear 101 : Vo max. clear 110 : all clear 111,xxx : clear nothing		
	GIPAM Internal ERROR CODE		33005	Reserved
04h	Current QUERY			
	R Phase Current	FLOAT	33021	Example)33021 F
	S Phase Current	FLOAT	33023	Example)33023 F
	T Phase Current	FLOAT	33025	Example)33025 F
04h	Line-To-Line Voltage			
	R-S	FLOAT	33041	Example)33041 F
	S-T	FLOAT	33043	Example)33043 F
	T-R	FLOAT	33045	Example)33045 F
04h	Power Factor, Active			

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
	Power, Reactive Power			
	PF	FLOAT	33061	Example)33061 F
	W	FLOAT	33063	Example)33043 F
	VAR	FLOAT	33065	Example)33045 F
04h	Frequency, Active Energy, Reactive Energy			
	Frequency	FLOAT	33081	Example)33081 F
	Active Energy	FLOAT	33083	Example)33083 F
	Reactive Energy	FLOAT	33085	Example)33085 F
04H	Phase Voltage			
	R Phase Voltage	FLOAT	33101	Example)33101 F
	S Phase Voltage	FLOAT	33103	Example)33103 F
	T Phase Voltage	FLOAT	33105	Example)33105 F
04h	Zero Sequence Voltage			
	Vo	FLOAT	33121	Example)33121 F
	Vo MAX	FLOAT	33123	Example)33123 F
The meaning is different according to SUB COMMAND value.				
SUB COMMAND = 1				
04h	SOE DATA (FAULT Event)			
	SUB COMMAND	BYTE	33141	Lower 1 BYTE
	DEVICE ID	BYTE	33142	Lower1 BYTE
	Time Tag	LONG	33143	Example)33143 L
	* RELAY Operation Status	INT	33145	BIT Operation

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
15 – Ir> 14 – Is> 13 – It> 12 – In> 11 – Ir>> 10 – Is>> 9 – It>> 8 – In>>		7 – OVR 6 – UVR 5 – VG> 4 – SGR 3 – VG>> 2 – 1 1 – 1 0 – SYS		
	* Reserved	INT	33146	Reserved
SUB COMMAND = 2				
04h	SOE DATA (Relay SETTING Information)			
	SUB COMMAND	BYTE	33141	Lower 1 BYTE
	DEVICE ID	BYTE	33142	Lower 1 BYTE
	Time Tag	LONG	33143	Example)33143 L
	* RELAY SETTING	INT	33145	BIT Operation (Lower 1 BYTE)
7,6,5,4 : 1 3 : remote Setting 2 : Local Setting		1 : remote fault reset 0 : local fault reset		
	Reserved	INT	33146	Reserved
SUB COMMAND = 3				
04h	SOE DATA (CB Status and DATA CLEAR Information)			
	SUB COMMAND	BYTE	33141	Lower 1 BYTE
	DEVICE ID	BYTE	33142	Lower 1 BYTE
	Time Tag	LONG	33143	Example)33143 L
	* CB Status	BYTE	33145(H)	BIT Operation (Higher 1 BYTE)
7 : local on 6 : local off 5 : remote on 4 : remote off		3,2 : 1 1 : on Input 0 : off Input		
	* CB Status Change	BYTE	33145(L)	BIT Operation (Lower 1 BYTE)

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
7 : local on 6 : local off 5 : remote on 4 : remote off		3,2 : 0 1 : on Input 0 : off Input		
	* LOCAL CLEAR	BYTE	33146(H)	BIT Operation (Higher 1 BYTE)
7,6 : 1 5 : Vo max 4 : CB ON time 3 : CB ON counter		2 : SOE buffer 1 : varh 0 : wh		
	* REMOTE CLEAR	BYTE	33146(L)	BIT Operation (Lower 1 BYTE)
7,6 : 1 5 : Vo max 4 : CB ON time 3 : CB ON counter		2 : SOE buffer 1 : varh 0 : wh		
05h	SOE DATA Remove		3401	Control Command
* Command for requesting the next data after removing the present data in SOE buffer with single query is not supported				
04h	Measurement Part SETTING DATA Query			
	Setting CT Ratio	BYTE	33201	Lower 1 BYTE
	Setting PT Ratio	BYTE	33202	Lower 1 BYTE
	Setting System Wiring	BYTE	33203	Lower 1 BYTE
	Setting Relay Enable	BYTE	33204	Lower 1 BYTE
	CB Operation Count	INTEGER	33205	
	CB Run Time(SEC)	INTEGER	33206	
	CB Run Time(1000h)	BYTE	33207	Lower 1 BYTE
04h	OCR/OCGR SETTING DATA			
	Operating Current Value in Time Delay char. of	BCD	33221(H)	X.X (Higher 1 BYTE)

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
	OCR			
	Operating Current Value in Instantaneous char. of OCR	BCD CODE	33221(L)	XX (Lower 1 BYTE)
	OCR CURVE	BCD CODE	33222	0X (Lower 1BYTE)
	Operating Time of OCR	BCD CODE	33223	0X.XX Higher BYTE : 0X Lower BYTE : .XX
	Operating Current Value in Time Delay char. of OCGR	BCD CODE	33224(H)	.XX (Higher 1 BYTE)
	Operating Current Value in Instantaneous char. of OCGR	BCD CODE	33224(L)	X.X (Lower 1 BYTE)
	OCGR CURVE	BCD CODE	33225	0X(Lower 1BYTE)
	Operating Time of OCGR	BCD CODE	33226	0X.XX Higher BYTE : 0X Lower BYTE : .XX
	Selecting OCGR Function	BCD CODE	33227	0X(Lower 1BYTE)
04h	OVR/UVR SETTING			
	OVR Operating Voltage	BCD CODE	33241	0X.XX Higher BYTE : 0X Lower BYTE : .XX
	OVR Operating Time	BCD CODE	33242	XX.X0 Higher BYTE : 0X Lower BYTE : .XX
	Selecting OVR Function	BCD CODE	33243	0X(Lower 1 BYTE)
	UVR Operating Voltage	BCD CODE	33244	.XX(Lower 1 BYTE)
	UVR Operating Time	BCD CODE	33245	XX.X0 Higher BYTE : 0X Lower BYTE : .XX
	Selecting UVR Function	BCD CODE	33246	0X(Lower 1 BYTE)
04h	OVGR/SGR SETTING			

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
	Operating Voltage Value in Time Delay char. of OVGR	BCD CODE	33261(H)	.XX(Higher 1 BYTE)
	Operating Voltage Value in Instantaneous char. of OVGR	BCD CODE	33261(L)	.XX(Lower 1 BYTE)
	OVGR Operating Time	BCD CODE	33262	0X.XX Higher BYTE : 0X Lower BYTE : .XX
	Selecting OVGR Function	BCD CODE	33263	0X(Lower 1 BYTE)
	SGR Operating Current	BCD CODE	33264(H)	X.X(Higher 1 BYTE)
	SGR Operating voltage	BCD CODE	33264(L)	X.X(Lower 1 BYTE)
	SGR Operating Time	BCD CODE	33265	XX.X0 Higher BYTE : 0X Lower BYTE : .XX
	Selecting SGR Function	BCD CODE	33266	0X(Lower 1 BYTE)
	RESERVED	BCD CODE	33267	0X(Higher 1 BYTE)
04h	SOE ENABLE and TIMER Status Information			
	RELAY Operation EVENT ENABLE	INT	33281	BIT Operation
	CB Status Change EVENT ENABLE	INT	33282	BIT Operation (Lower 1 BYTE)
7 : local on 6 : local off 5 : remote on 4 : remote off		3,2 : 0 1 : on Input 0 : off Input		
	RESET/CLEAR EVENT ENABLE	INT	33283	BIT Operation (Lower 1 BYTE)
7 : relay setting 6 : fault reset 5 : Vo max 4 : CB ON time		3 : CB ON counter 2 : SOE buffer 1 : varh 0 : wh		
	GIPAM Internal TIMER Calibration	INT	33284	
04h	DEVICE Name and	STRING	33301	Example)33301-33306 M

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
	VERSION Information			
04h	SBO ARM TIME Read	INT	33321	
Example) To send Query for reading SBO ARM TIME to SOE GIPAM with station address number 1 QUERY : 01 04 0C F8 00 01 B3 6B				
05h	RELAY FAULT RESET		3041	Control Command(No ACK)
05h	CLEAR WH		3061	Control Command(No ACK)
05h	CLEAR VARH		3081	Control Command(No ACK)
05h	CLEAR ALL SOE DATA		3101	Control Command(No ACK)
05h	CLEAR CB ON COUNT		3121	Control Command(No ACK)
05h	CLEAR CB ON TIME		3141	Control Command(No ACK)
05h	CLEAR Vo MAX		3161	Control Command(No ACK)
05h	CLEAR ALL BACKUP DATA		3181	Control Command(No ACK)
05h	RELAY FAULT RESET		3241	Control Command(With ACK)
05h	CLEAR WH		3261	Control Command(With ACK)
05h	CLEAR VARH		3281	Control Command(With ACK)
05h	CLEAR ALL SOE DATA		3301	Control Command(With ACK)
05h	CLEAR CB ON COUNT		3321	Control Command(With ACK)
05h	CLEAR CB ON TIME		3341	Control Command(With ACK)
05h	CLEAR Vo MAX		3361	Control Command(With ACK)
05h	CLEAR ALL BACKUP DATA		3381	Control Command(With ACK)
06h	CB ON/OFF Select		43341	
06h	CB ON/OFF Operate		43361	
Example) To send CB ON SBO command to SOE GIPAM with station address number 1 1st Step) Send CB ON Select Command : 01 06 0D 0C 60 96 E3 0B 2nd Step) After receiving ACK response, Send CB ON Operate Command : 01 06 0D 20 9F 69 23 72 Example) To send CB OFF SBO command to SOE GIPAM with station address number 1 1st Step) Send CB OFF Select Command: 01 06 0D 0C 61 69 A2 DB 2nd Step) After receiving ACK response, Send CB OFF Operate Command : 01 06 0D 20 9E 96 62 A2				

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
06h	CB SBO CANCEL		43341	SBO Cancel Command.
Example) To send SBO cancel command to SOE GIPAM with station address number 1 after sending SBO select command QUERY) 01 06 0D 0C 00 FF 0B 25				
06h	SBO ARM TIMER SETTING		43021	With ACK
Example) To send SBO ARM TIMER setting command to SOE GIPAM with station address number 1(With ACK) QUERY) 01 06 0B CC 07 D0 48 7D				
06h	SBO ARM TIMER SETTING		43001	No ACK.
Example) To send SBO ARM TIMER setting command to SOE GIPAM with station address number 1(No ACK) QUERY) 01 06 0B B8 07 D0 08 67				
10h	SOE EVENT SETTING			
	FAULT #1		43001	No ACK
	FAULT #2		43002	No ACK
	CB		43003	No ACK
	SETTING / RESET		43004	No ACK
10h	SOE EVENT SETTING			
	FAULT #1		43021	With ACK
	FAULT #2		43022	With ACK
	CB		43023	With ACK
	SETTING / RESET		43024	With ACK

17.5.8 GMPC III

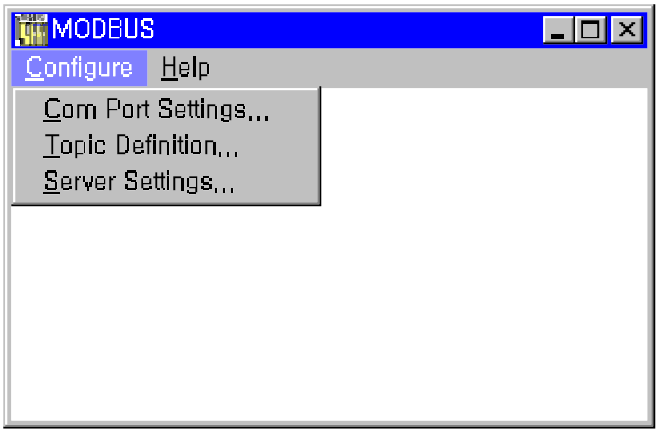
OP CODE	Meaning	DATA TYPE	ADDRESS	Description
10h	Year		49801	00 – 99
	Mon		49802	0 – 12

OP CODE	Meaning	DATA TYPE	ADDRESS	Description
	Day		49803	0 - 31
	Hour		49804	0 - 24
	Min		49805	0 - 60
	Sec		49806	0 - 60
04h	Year		39801(H)	00 - 99
	Mon		39801(L)	0 - 12
	Day		39802(H)	0 - 31
	Hour		39802(L)	0 - 24
	Min		39803(H)	0 - 60
	Sec		39803(L)	0 - 60
	err		39804(H)	0 = no errer, 1 = error
	T/M		39804(L)	0 = no t/m, 1 = t/m
	Sync_en		39805(H)	GIMAC SYNC 0 = Sync Disable, 1 = Sync Enable
	is_sync		39805(L)	Between GMPC III s 0 = Sync Disable 1 = Sync Enable
	Inet_addr		39806(H)	I-NET Address
	RS232/485		39806(L)	0 = RS485, 1 = RS232
	Baud_num		39807	GMPC III Baud Rate 0 - 2400 BPS 1 - 4800 BPS 2 - 9600 BPS 3 - 14400 BPS 4 - 19200 BPS 5 - 28800 BPS 6 - 33600 BPS 7 - 38400 BPS 8 - 56000 BPS 9 - 57600 BPS
06h	Write_time_master		49821	0 = off, 1 = on
	Write_sync_enable		49841	0 = off, 1 = on
	I-NET Address		49861	I-NET Address, 0 - 255

13 InTouch and Modbus I/O Server User Manual

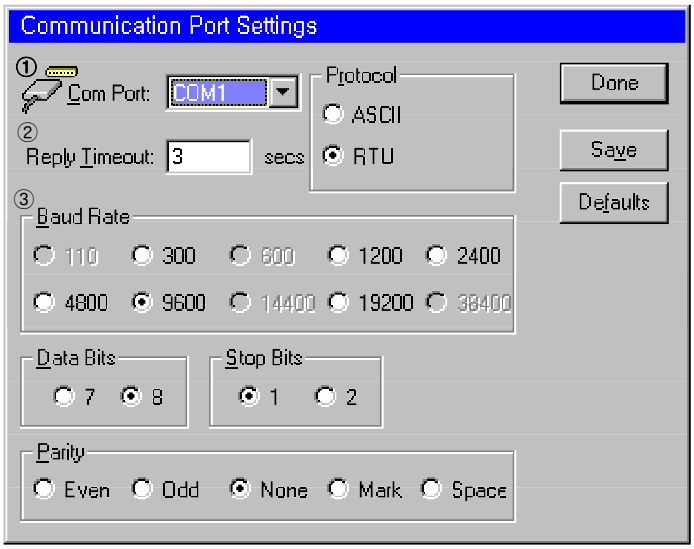
13.1 Setting of Modbus I/O Server

13.1.1 Main View of Modbus I/O Server



13.1.2 Com Port Setting

- Setting COM port to connect with GMPC III MODBUS



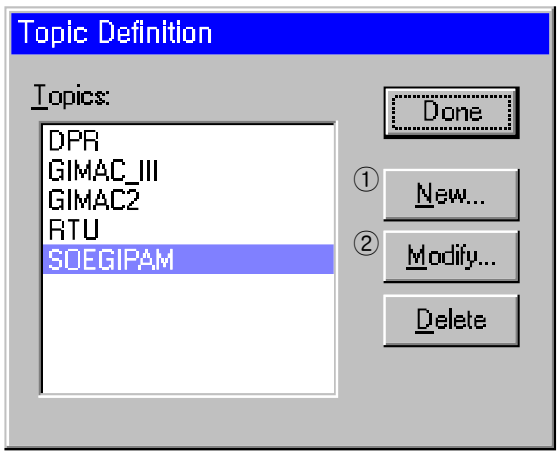
① Select COM port to connecting with GMPC III MODBUS

② Setting the Timeout period when there is no response from Device

③ Setting the Baud rate

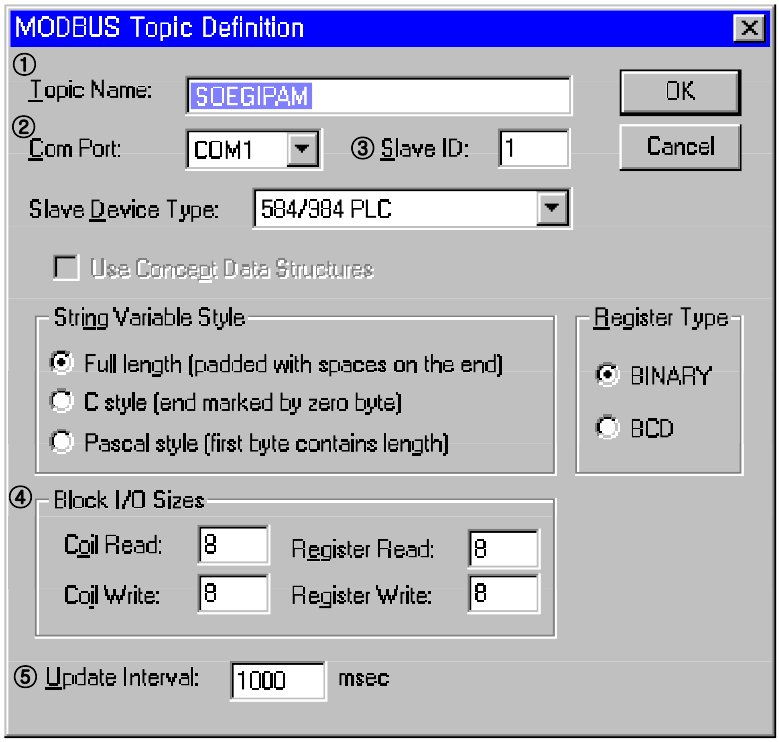
13.1.3 Topic Definition

- Creating New Topic and Modification of setting variables in created Topic



① Creating new Topic

② Modification of setting variables in created Topic



① Setting the name of Topic.(The name must be the same name of Access Name in Topic Name)

② Select COM Port

③ Select Slave ID of Modbus

④ Coil Read : Set maximum number of Coil Registers in a query to 8

Coil Write : Set maximum number of Coil Registers in a command to 8.

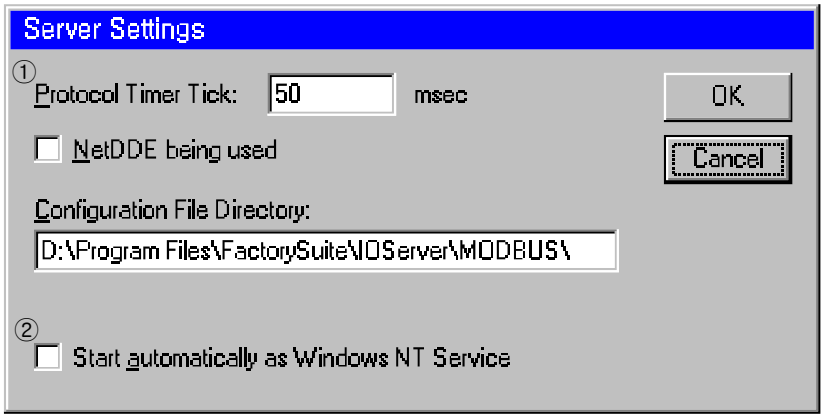
Register Read : Set maximum number of Registers in a query to 8

Register Write : Set maximum number of Registers in a command to 8.

⑤ Set time Period between queries.

13.1.4 Server Setting

- Setting I/O Server



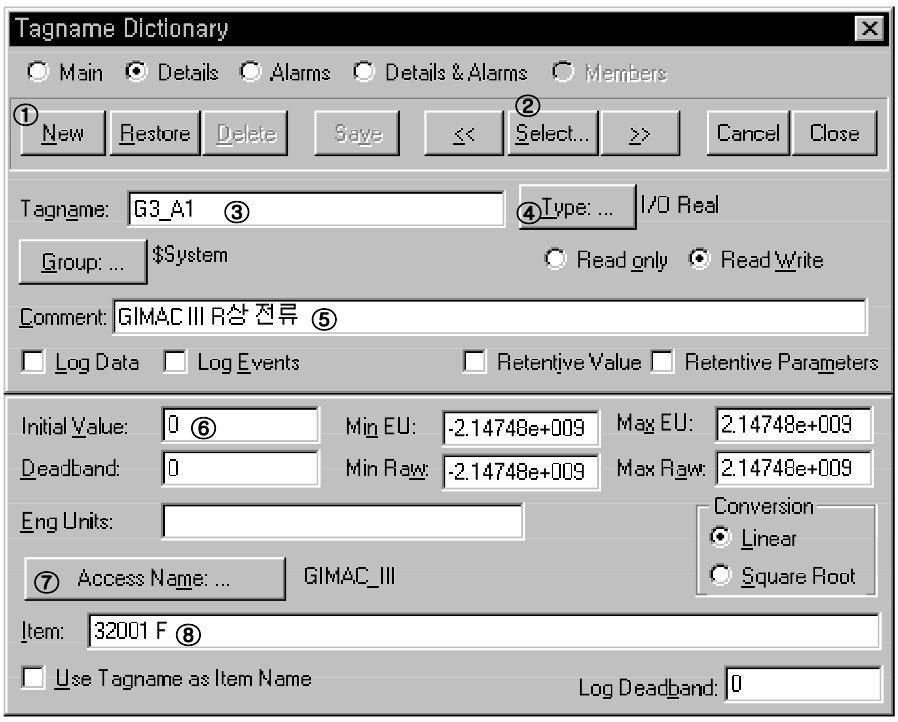
① Set data processing period in Server

② I/O server starts its operation automatically when Windows NT is initialized

13.2 InTouch User Manual

13.2.1 Definition of Tag

- Definition of Tag



① Define new Tag

② Select old Tag

③ Type the name of the Tag

④ Select type of the Tag

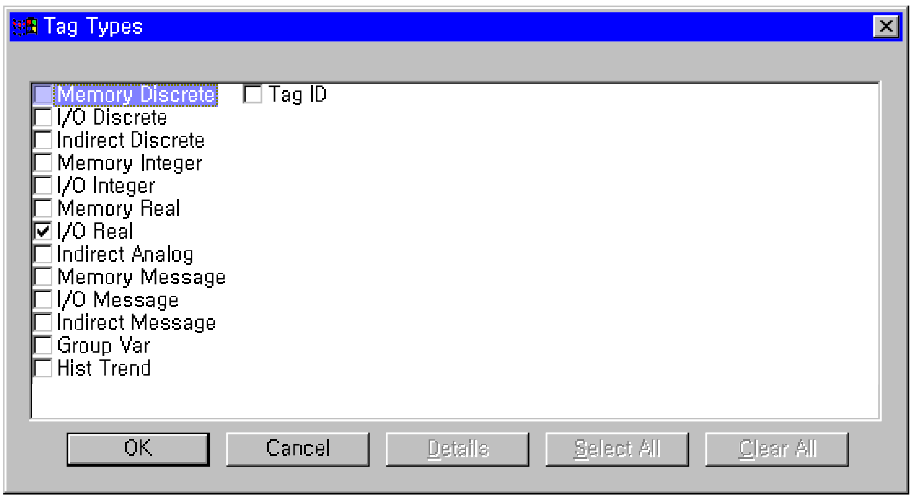
⑤ Type the comments of the Tag 의 주석을 입력합니다.

⑥ Type initial value of the Tag

⑦ Type Access Name of Tag

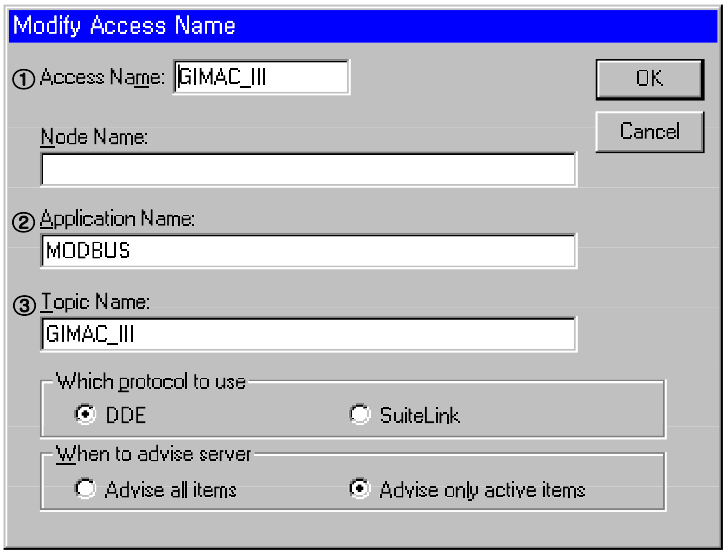
⑧ Type Address of the Tag

13.2.2 Setting Tag Type



- A tag with Tag Name starting with " Memory" is internal tag and a tag with Tag Name starting with " I/O" is external tag
- Discrete : Binary Type, 1bit
- Integer : Integer Type, 32bit
- Real : Floating Point Type, 32bit
- Message : String Type, 131Byte in max

13.2.3 Setting Access Name



① Type the same Topic Name of ③

② Type name of I/O Server(Modbus)

③ Type the Topic Name in Topic Definition of I/O Server.

2003-10

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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.

⚠ Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance. Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

Global network

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User Manual 2003 / (01) 2003.10 Printed in Korea STAFF